RADIOLOGY

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COURSES IN RADIOLOGY

The information set forth on the following pages has been compiled directly from the publications of the various collegiate institutions enumerated. There is no claim made that all schools giving courses of instruction in radiology are herein listed; only that those to whose catalogues the Editor has had access have published their facilities as here set forth. It has been the aim to omit none; if such an omission has occurred, it has been unintentional. All radiologists must be united in the hope that each year will see more courses, with wider opportunities, offered for the training of under-graduates and physician-radiologists.

BAYLOR UNIVERSITY COLLEGE OF MEDICINE. Located at Dallas, Texas. Walter H. Moursund, M.D., *Dean.*

Course in Roentgenology (Department of Surgery, fourth year). Thirty-two hours; one hour per week throughout the entire session. The subject is covered by a systematic course of lectures, quizzes, and demonstrations. In connection with various members of the staff, diagnosis demonstrations are given upon patients whose physical condition has been made the object of investigation before sections of the class. James M. Martin, M.D., *Professor of Roentgenology.*

UNIVERSITY OF BUFFALO SCHOOL OF MEDICINE. Located on High Street, near Main Street, Buffalo, New York. C. Sumner Jones, B.S., M.D., *Dean.*

(Department of Dermatology and Syphilology.) In the course of the clinical work given to small groups of students at the Buffalo City Hospital and the Buffalo General Hospital, instruction is given in special treatment with X-ray and radium.

(Department of Surgery. Third year, Course III (a), Radiology.) Edward C. Koenig, M.D., *Associate in Radiology.* One lecture a week for twenty-two weeks. *(Fourth year, Course III.)* In addition, instruction is given to the fourth year students in the preparation and interpretation of X-ray plates, by Dr. Koenig.

Post-graduate Course. The following lectures are among those given: The Limitations and Value of the X-ray in Gastro-intestinal Lesions (Dr. Koenig); Diagnostic Points in the Early Recognition of Cancer of the Cervix and the Place of Radium in its Treatment (James E. King, M.D.); X-ray Studies as an Aid in the Diagnosis of Diseases of the Heart and Lungs (Clifford R. Orr, M.D.).

UNIVERSITY OF CALIFORNIA MEDICAL SCHOOL. Located at Parnassus and Third Avenues, San Francisco. Lionel S. Schmitt, B.S., M.D., *Acting Dean.*

Department of Roentgenology. Howard E. Ruggles, A.B., M.D., *Assistant Clinical Professor of Roentgenology.* Lloyd Bryan, B.S., M.D., *Assistant Clinical Professor of*

Roentgenology. O. S. Cook, B.S., M.D., *Instructor in Roentgenology.* Samuel B. Randall, A.B., M.A., M.D., *Assistant in Roentgenology.* The required work in this department is given in the second half of the third year and consists of lectures and demonstrations of plates. Elective work is offered in the second half of the fourth year.

Course 101, Lectures and demonstrations, third year. Assistant Clinical Professor Ruggles. Second half-year, once a week, for eight weeks.

Fourth-year Elective Course 201. Students will be assigned to assist in technical work under the direction of the Staff. Single or double course.

Courses of Instruction Offered by the X-ray Department. Faculty and Staff: Howard E. Ruggles, A.B., M.D., *Assistant Clinical Professor of Roentgenology, Chief of the Department and Roentgenologist to the University Hospital;* Lloyd Bryan, B.S., M.D., *Assistant Clinical Professor of Roentgenology;* Orrin Cook, M.D., *Instructor in Roentgenology, Roentgenologist to Hahnemann Hospital;* Samuel B. Randall, M.D., *Assistant in Roentgenology, Assistant Roentgenologist to University Hospital.* In the interest of better roentgenology and in response to numerous requests for such work, the University of California Medical School offers two courses in roentgenology. The teaching facilities of the School and the unusual volume of practical work in the University and affiliated hospitals, together with the large staff necessary to operate the several plants, provide exceptional opportunities to students.

Admission to this course is limited to graduate physicians. The tuition fee is $100 per month, and students may be admitted at any time. Not more than two students may be in attendance at any one time. The course will continue throughout the year at the University and affiliated hospitals. The work will be adjusted somewhat to meet the requirements of individual students, but in general will consist of:

1. *Lectures.* Lectures and informal talks will be given upon the mechanical, diagnostic and therapeutic aspects of roentgenology.

2. *Interpretation.* There will be daily exercises in interpretation of plates under the personal supervision of Dr. Ruggles and Dr. Bryan.

3. *Fluoroscopy.* The technic of fluoroscopic manipulation and fluoroscopic interpretation will be covered in daily exercises under the personal supervision of Dr. Ruggles, Dr. Bryan, and Dr. Cook.

4. *Technic.* This will include the mechanism and practical care of the apparatus and equipment of a modern plant, standard positions of exposure and exposure time.

5. *Therapy.* Practical demonstrations in the methods and technic of X-ray therapy.

6. *Records.* Filing and indexing of plates.

Persons desiring to do so will be given opportunity to devote special attention to dental roentgenography.

Technicians' Course. This course is intended primarily for graduate nurses who wish to become technical assistants in this field. Other persons with necessary educational qualifications will be accepted. This course will be given twice a year in six-month periods, as follows: January to June and July to December. Tuition fee for the six months' course, $150. Course limited to two students at one time. Instruction is given by members of the faculty and by experienced technicians of the department, and consists of:

1. *Lectures.* Lectures and informal talks on the indications for X-ray and electrical work; dangers in the use of the X-ray; methods of protection for patients and operators; technic of exposures; dark room technic, and the care and use of tubes and apparatus.

2. *Technic.* This will include the mechanism and practical care of the apparatus

and equipment of a modern plant; methods of posing; exposures, and the general mechanics of the work.

3. *Therapy.* Practical demonstrations in the methods and technic of X-ray therapy.

4. The filing and indexing of plates and the methods of keeping and filing the records.

Students taking this course are expected to devote their entire time to the work in one or more of the hospitals under the direction of members of the department.

Persons desiring to take either of these courses should make application to the Dean's Office, at the address given above.

UNIVERSITY OF CHICAGO MEDICAL SCHOOLS (RUSH MEDICAL COLLEGE). Located at 1748 West Harrison Street, Chicago, Illinois. Ernest E. Irons, M.D., Ph.D., *Dean.*

Course in Roentgenology (Junior and Senior Years, Department of Surgery). A conference and demonstration course on the use of the X-ray in diagnosis and treatment, and on the general principles of radiographic technic. Limited to twenty-five students. Assistant Clinical Professor Cassie B. Rose, M.D.

UNIVERSITY OF COLORADO Denver, Colorado. Maurice H. Rees, A.M., Ph.D., M.D., *Dean.*

(Department of Surgery.) Course in Roentgenology. Lectures and demonstrations on the diagnostic and therapeutic uses of the roentgen ray and on the interpretation of films. Spring quarter, twenty hours. Samuel B. Childs, B.A., M.D., *Associate Professor of Roentgenology.*

COLLEGE OF PHYSICIANS AND SURGEONS (School of Medicine, Columbia University). Located at 437 West 59th Street, New York City. William Darrach, A.B., A.M., M.D., *Dean.*

Considerable instruction is given in roentgenology by the clinical departments, both in the third and fourth years, especially in the Departments of Medicine and Surgery. Ross Golden, M.D., who is in charge of the work at the Presbyterian Hospital, is a member of the Department of Medicine.

Graduate work.—In Department of Dermatology and Syphilology, *Course 204, Practical instruction in the diagnosis and treatment of diseases of the skin, and syphilis; instruction in radiotherapy,* fourth year. G. M. MacKee, M.D., Fred Wise, M.D., and Isadore Rosen, M.D., *professors;* A. B. Cannon, M.D., E. W. Abramowitz, M.D., and Max Scheer, M.D. (Vanderbilt Clinic). *Course 209, Radiotherapy in skin diseases, fourth year.* G. C. Andrews, A.B., M.D. (Vanderbilt Clinic). In Department of Physiology, *Course 108, Physics of the X-ray* (course elective for candidates for degree of M.D.). H. B. Williams, A.B., M.D., *professor.*

CORNELL UNIVERSITY MEDICAL COLLEGE. Located at 477 First Avenue, New York City. (Any student may take the first year at either New York City or Ithaca. All students take the last three years at New York City only.) Walter L. Niles, M.D., *Dean.*

Course in Roentgenology. Harry M. Imboden, M.D., *Professor of Roentgenology;* Albert B. Ferguson, M.D., *Instructor in Roentgenology;* Ramsay Spillman, M.D., *Instructor in Roentgenology.* The course consists of the demonstration of the apparatus and the method of making roentgen examinations. The time is largely spent in considering the scope and accuracy of this method of diagnosis in all branches of medicine. This includes the study and interpretation of roentgenograms showing foreign bodies, fractures, dislocations and

bone and joint lesions, renal, ureteral and vesical calculi and other lesions which can be detected roentgenographically, including pyelography. Lesions of the skull, the study of the teeth, infections of the accessory sinuses, together with the roentgen diagnosis of joint lesions produced by these infections, will be considered. Respiratory lesions—abscesses, tumors of the lungs, mediastinal tumors—are carefully considered, special attention being devoted to the early diagnosis of pulmonary tuberculosis. Lesions of the gastro-intestinal tract, such as strictures and diverticula of the esophagus, and growths are studied. Particular emphasis is given to the motor phenomena of the stomach; to the diagnosis of gastro-duodenal lesions, such as carcinoma, ulcers of the stomach and duodenum, and to gall-bladder infection, with or without calculi. As far as possible this work is carried on in conjunction with the other clinical departments, all students having the opportunity of studying individual cases clinically before the roentgenographic study, then comparing the clinical findings, the roentgen findings, and, if possible, the surgical findings in such cases as require surgical procedure. After having had demonstrated to them a series of plates on allied subjects, the students are, in turn, required to re-interpret these roentgenograms to the class. This method has proved exceedingly valuable and will be followed to a great extent.

Finally, the course concludes with lectures on roentgen therapy, covering the treatment of both superficial and deep-seated lesions, describing the cross-fire method, the advantage of high penetration with the Coolidge tube, and methods of dosage in the application of rays, with or without filters.

Summary: Second year, sections, 10 hours; third year, lectures, 21 hours, sections, 10 hours; fourth year, lectures, elective.

Clinical Research. Clinical studies in the diagnosis, natural history and treatment of neoplastic diseases are conducted in the hospital by the members of the staff. The general conduct of the ward service is in charge of William S. Stone, M.D., *Clinical Director.* The Radium Department is in charge of Douglas Quick, M.D. Other special departments are conducted by B. S. Barringer, M.D., Burton J. Lee, M.D., William P. Healey, M.D., and others. The radium laboratory possesses four grams of radium metal, supplied by the National Radium Institute through the late James Douglas, M.D. The radium laboratory is in charge of Mr. Gioacchino Failla, *Physicist,* and four assistants. The X-ray Department is in charge of Ralph E. Herendeen, M.D., *Roentgenologist.* Professor Walter F. Wilcox is *Consulting Statistician.*

Fourth Year Elective Course. IV. Fluoroscopy of the Gastro-intestinal Tract. A. L. Holland, M.D. (New York Hospital). One month periods, Tuesdays and Fridays, 4 to 6 P. M. Six students.

DETROIT COLLEGE OF MEDICINE AND SURGERY. Located at St. Antoine and Mullett Streets, Detroit, Michigan. W. H. MacCraken, M.D., F.A.C.P., *Dean.*

Department of Roentgenology. J. H. Dempster, A.B., M.D., F.A.C.P., *Professor;* William A. Evans, M.D., *Associate Professor;* M. W. Clift, M.D., *Associate Professor;* J. C. Kenning, M.D., *Associate Professor.*

The instruction in roentgenology is distributed through the third and fourth years of the medical course. The general plan is to acquaint the student with the development of the bony skeleton, the roentgen appearance of the normal osseous system, the roentgen findings in surgical pathology, and the uses of the roentgen ray in internal medicine.

Third Year Course—Lectures and Demonstrations. The history of roentgenology; X-ray physics; the electron; physiological effects of the X-rays; the dangers and methods of protection from them; anatomy from the viewpoint of density of structures; technic (so far as to illustrate the scope and

limitations of X-ray work); stereoscopy and fluoroscopy, and fractures and dislocations.

Fourth Year Course—Lectures and Clinics. X-ray as diagnostic aid in clinical medicine: cardiac, pulmonary and gastrointestinal findings by X-ray methods; pyelography; principles of X-ray therapy in benign and malignant conditions. A large number of radiographs will be shown in the class and the hospital, illustrating conditions which arise in the routine hospital and private practice.

GEORGE WASHINGTON UNIVERSITY MEDICAL SCHOOL. Located at Washington, D. C. William C. Borden, M.D., *Dean.*

Department of Roentgenography. Arthur C. Christie, M.S., M.D., *Professor;* Thomas A. Groover, M.D., *Associate Professor;* Edwin A. Merritt, M.D., *Associate.*

The course consists of weekly lectures and demonstrations during the latter half of the year to the third year class and of practical clinical demonstration of apparatus and the application of the X-ray to diagnosis during the entire fourth year. A fully equipped roentgen laboratory is maintained in the University Hospital and Dispensary, and clinical demonstrations are also given to the fourth year students at the X-ray laboratory at Garfield Memorial Hospital.

HARVARD MEDICAL SCHOOL. Located at 240 Longwood Avenue, Boston, Mass. S. R. Meaker, M.D., *Secretary.*

COURSES FOR GRADUATES

Department of Roentgenology. George W. Holmes, M.D., *Assistant Professor;* Patrick F. Butler, M.D., *Instructor;* Richard Dresser, M.D., *Assistant;* Alexander MacMillan, M.D., *Assistant;* Merrill C. Sosman, M.D., *Instructor.*

Courses for graduates. (In order to avoid disappointment regarding admission to courses in this department, registration must be arranged in advance.)

391, General Roentgenology. Dr. Holmes and assistants (Massachusetts General Hospital, X-ray Department). Monthly; daily, except Saturday, 9 A. M. to 4 P. M. Attendance limited to three. Women not admitted. Fee, $100. This course is designed to give the student an elementary, working knowledge of roentgenology. Special attention is given to diagnosis as interpreted from the radiographic film and fluoroscopic screen. An opportunity is afforded to observe and study the large number of cases sent to the department for examination. The course is so arranged that it is possible for the student to receive instruction in all types of radiographic examinations and in roentgen therapy. He is advised as to the recent roentgen literature, and given an opportunity to study a collection of films selected to show the radiographic appearance of normal and pathological processes.

392, General Roentgenology. Dr. Sosman (Peter Bent Brigham Hospital, X-ray Department, and Collis P. Huntington Memorial Hospital, X-ray Department). Monthly; daily. Fee, $75. This is not a set or didactic course but an opportunity to observe all of the routine work in the X-ray Department, both diagnostic and therapeutic. Attendance at staff rounds, operations and autopsies on the cases seen in the department is customary. Limited to two men a month.

393, General Roentgenology. Dr. Butler (Boston City Hospital, X-ray Department). Monthly; daily, 9 A. M. to 12 M. Fee, $75. A course dealing with the use of the X-ray in general medical and surgical diagnosis and therapy. It is designed for practitioners as well as for those who have had some experience in the use of the X-rays. Opportunity is given to gain practice in the interpretation of radiograms and to study with the screen the material of a large medical and surgical clinic.

394, Roentgenology in Diseases of the Eye, Ear, and Accessory Sinuses. Dr. Mac-

Millan (Massachusetts Charitable Eye and Ear Infirmary). Monthly; three days a week (days and hours to be arranged with instructor). Attendance limited to three. Women are admitted. Fee, $35. This is a practical course in the roentgen diagnosis of the eye, ear, accessory sinuses and mastoid, and includes the localization of foreign bodies in the eye. Roentgenotherapy will be taken up where indicated. The facilities for study include both current cases and a catalogued collection of plates. This course may be taken in conjunction with other courses given at the Massachusetts Charitable Eye and Ear Infirmary.

In addition to the short-time courses listed, the faculty can usually make special arrangements for students interested in long-time study. Such arrangements, however, are made individually for each applicant.

HOWARD UNIVERSITY MEDICAL COLLEGE. Located at 5th and W Streets, Northwest, Washington, D. C. Edward A. Balloch, A.M., M.D., F.A.C.S., *Dean.*

Course in Roentgenology. Herbert C. Scurlock, A.B., A.M., M.D., *Professor.* Lectures and demonstrations on the use of the X-ray in medicine and surgery. Second year, first semester: lectures, 18 hours; demonstrations, 18 hours.

ILLINOIS POST-GRADUATE MEDICAL SCHOOL, INC. Located at 1844 West Harrison Street, Chicago, Ill. Incorporated not for profit. *Trustees:* T. A. Davis, M.D.; W. L. Noble, M.D.; A. C. Wiener, M.D.; T. J. Conley, M.D.; J. P. Smyth, M.D. *Officers:* Thomas A. Davis, M.D., *President;* T. J. Conley, M.D., *Vice-president;* James A. Clark, M.D., *Secretary;* John M. Lang, M.D., *Treasurer.*

Course in Roentgenology. J. A. Maloney, M.D., *Professor.* The work in this department is divided into technic and interpretation. The physics of the production of X-rays is explained in detail, while the mechanics of machine manipulation, dark room procedures, etc., involved in making roentgenograms, are made familiar to the student.

A wealth of varied material is available for plate-interpretation and fluoroscopic work on the chest and gastro-intestinal tract. Modern equipment for deep therapy is provided. This work is gone into with those interested. Tuition for the course is $100. The course, as outlined, covers four weeks, beginning the first of each month.

A course for radiological technicians is also offered.

UNIVERSITY OF ILLINOIS COLLEGE OF MEDICINE. Located at Congress and Honore Streets, Chicago, Illinois. William H. Browne, *Secretary.*

Division of Radiology. Four-hour required course in second semester of fourth year. It is contemplated to offer an elective course of sixteen hours covering the technical, diagnostic and therapeutic application of the roentgen ray in medicine and surgery. Also, a required course of sixteen hours covering the entire field of roentgenology. Adolph Hartung, M.D., *Head of Division.*

INDIANA UNIVERSITY SCHOOL OF MEDICINE. Located at Bloomington and Indianapolis, Indiana. Charles P. Emerson, A.B., M.D., *Dean.*

Department of Roentgenology under direction of Raymond C. Beeler, M.D., *Assistant Professor of Roentgenology,* and Lester A. Smith, M.D., *Associate in Roentgenology.* Students receive personal instruction in the wards of the Robert W. Long Hospital. Course consists of one hour a week during the first semester.

THE STATE UNIVERSITY OF IOWA COLLEGE OF MEDICINE. Located at Iowa City, Iowa. L. W. Dean, M.D., *Dean.*

Course in Roentgenology. Bundy Allen, M.D., Head of Department. The course, of about eighteen hours for each student, consists of demonstrations of the apparatus and method of making direct and stereo-roentgenographic examinations of various parts of the body, consideration also being given to the scope and accuracy of this method of diagnosis in all branches of medicine. Attention is given to the study and interpretation of roentgenograms showing foreign bodies, fractures, dislocations, renal, ureteral, and vesical calculi, infections of teeth, accessory sinuses, and such other lesions, including respiratory and gastro-intestinal, as can be detected roentgenographically.

So far as possible this work is carried on in conjunction with the clinical departments, all students having the opportunity of studying the individual cases clinically before the roentgen study, then comparing the clinical findings, the roentgen findings, and, if possible, the surgical findings in such cases as require surgical procedure.

A description of roentgenotherapy covering the treatment of both superficial and deep-seated lesions, describing the cross-fire methods, together with the demonstration of the application of radium therapy, the method of dosage, and the application of roentgen and radium rays with filters—all these are covered in the Junior Year, the class divided into sections.

UNIVERSITY OF KANSAS SCHOOL OF MEDICINE. Located at Lawrence and Kansas City, Kansas. H. R. Wahl, A.M., M.D., *Acting Dean.*

Courses in Roentgenology. Joseph L. McDermott, B.S., M.D., *Assistant Professor;* Lewis G. Allen, M.D., *Instructor.*

Roentgenology as Applied to Medicine: 18 hours; clinic. Dr. Allen.

Electrotherapeutics: Lectures and demonstrations; 18 hours; didactic. Dr. McDermott.

UNIVERSITY OF LOUISVILLE SCHOOL OF MEDICINE. Located at Louisville, Kentucky. Stuart Graves, A.B., M.D., *Dean.*

Course in Roentgenology. D. Y. Keith, M.D. (Amphitheatre City Hospital).

Clinical X-ray conference, Saturday, X-ray Department. J. W. Moore, B.S., M.D., F.A.C.P., *Professor of Medicine;* S. E. Johnson, A.B., M.S., Ph.D., M.D., *Professor of Gross Anatomy.*

Clinical X-ray conference, Friday, X-ray Department. H. H. Hagan, A.B., M.D., F.A.C.S., *Instructor in Surgery,* and Professor Johnson.

(Department of Medicine, Fourth Year.)
C. Clinical X-ray conference. Once a week the section meets in the X-ray Department. Cases from the medical side that have been X-rayed during the week are presented by the students and the plates by the roentgenologist. General discussion by staff, roentgenologist, and students. Ten hours. Dr. Moore, Dr. Johnson, and J. M. Kinsman, A.B., M.D., *Instructor in Medicine.*

(Department of Surgery, Third Year.)
3. Fractures and Dislocations. . . . The lectures are supplemented by exhibitions of X-ray films and demonstrations of cases from the wards which illustrate special fractures under discussion. Thirty-two hours, two semesters. W. I. Hume, M.D., *Clinical Instructor in Surgery.*

(Department of Surgery, Fourth Year.)
7. X-ray conference. In this conference the X-ray examinations of the surgical cases in the wards and in the dispensary during the week are reviewed and discussed from an X-ray and surgical point of view, with special reference to the surgical treatment. Ten hours. Dr. Hagan and Dr. Johnson.

LOYOLA UNIVERSITY SCHOOL OF MEDICINE. Located at 706 South Lincoln Street, Chicago, Illinois. Louis D. Moorhead, A.M., M.S., M.D., *Dean.*

Division of Radiology. Benjamin H. Orndoff, F.A.C.P., A.M., M.D., *Professor*

and Director of Division; John Baptiste Zingrone, *Radiologist to Mercy Hospital.*

The lectures on technic will include a brief résumé of the subject of electrical constitution of matter, electrons, light, conducting media, etc. Some time will also be devoted to the study of the construction of transforming apparatus and roentgen tubes, as well as action of light on sensitive photographic films. The clinical portion of the course consists of a study of roentgenograms of the skeletal system, digestive system, circulatory system, respiratory system, etc. The importance of fluorescent screen observations of the internal organs and the findings indicating pathology in their structure or in their function will be discussed and, so far as possible, these findings will be illustrated by lantern slides.

1. Roentgenology, Junior and Senior Years. A conference and demonstration course on the use of the X-ray in diagnosis and treatment and on the general principles of radiographic technic. Limited to fifteen students. Professor Orndoff.

2. Roentgenology at Mercy Hospital. A conference and demonstration course on the use of the X-ray in diagnosis and treatment and on the general principles of radiographic technic. Correlated with the work of the clinical departments. Limited to thirty students. In two sections. Mr. Zingrone.

UNIVERSITY OF MARYLAND SCHOOL OF MEDICINE. Located in Baltimore (Lombard and Greene Streets). J. M. H. Rowland, M.D., *Dean.*

Department of Roentgenology and Radiotherapy. Henry J. Walton, M.D., *Professor of Roentgenology;* Albertus Cotton, M.D., *Professor of Roentgenology;* Charles Reid Edwards, A.B., M.D., *Associate in Radiotherapy;* Howard E. Ashbury, M.D., *Associate in Roentgenology.* Instruction is given in the history, physics, and practical application of roentgen rays and radium. Especial effort is made to demonstrate the use of the roentgen ray in diagnosis by instruction both in fluoroscopy and plate reading. The sections of the fourth year class receive two hours' instruction each week. The student is also taught the practical application of radium and roentgen rays as therapeutic agents. In the X-ray laboratory and in the hospital wards students are shown the use of these agents in the treatment of disease.

UNIVERSITY OF MICHIGAN SCHOOL OF MEDICINE. Located at Ann Arbor, Michigan. Hugh Cabot, A.B., M.D., F.A.C.S., C.M.G., *Dean.*

Courses in Roentgenology. Preston M. Hickey, A.B., M.D., *Professor;* Ernst A. Pohle, M.D., *Assistant Professor;* E. W. Hall, A.M., M.D., *Instructor;* C. B. Bowen, M.D., *Instructor.*

The X-ray Department in the recently completed Hospital is very commodiously housed, and planned to provide ample facilities for the instruction of students in roentgenology. The examination rooms are adequate and are well suited for section teaching. A separate class room is provided in the department for didactic lectures and furnished with facilities for the demonstration of X-ray films and X-ray lantern slides.

Lectures on roentgenology and roentgentherapy are given in the Junior Year, so that each student in his Senior Year will have a working knowledge of the elementary facts of film interpretation. Elective courses are provided in the Senior Year, so that students so desiring can receive advanced instruction in roentgenology.

Course 1, Radiography and Radiotherapy. Lectures and demonstrations to the Third Year students, once a week throughout the year. Professor Hickey and Assistant Professor Pohle.

Course 2, Elective. Demonstrations and laboratory work in elementary X-ray technic. This course is of necessity given only to a limited number of students. Section will meet twice a week for a period of eight weeks.

Course 3, Elective. This course is designed to give practice in plate-reading, and

is given to a limited number of students. This class meets twice a week for a period of eight weeks. Courses will be repeated if necessary. Professor Hickey.

Course 4, Elective. Elementary demonstrations and clinical observations in radiotherapy. This course is given only to a limited number of students. Class meets once a week for a period of eight weeks. Assistant Professor Pohle.

Course 5, Elective. Course in X-ray technic, intended for non-medical students who desire to qualify as X-ray technicians. Hours for this course will be subject to special arrangement.

UNIVERSITY OF MINNESOTA: GRADUATE WORK IN MEDICINE IN THE MEDICAL SCHOOL AND THE MAYO FOUNDATION. Located at Minneapolis and Rochester, Minnesota. E. P. Lyon, Ph.D., M.D., D.Sc., *Dean of Medical School;* Louis B. Wilson, M.D., *Director of Mayo Foundation.*

Department of Radiology. A. Courses Offered at the Medical School. Professor Henry A. Erikson, B.E.E., Ph.D.; Assistant Professor Robert G. Allison, M.D. Graduates of Class A schools who have completed at least one year's satisfactory interneship in a recognized hospital are eligible for appointment as fellows in radiology. The student must carry one major and two minor branches. The major shall be in radiology and one of the minor branches must be in physics. The course extends over a period of three years. The course in radiology covers the use of the X-ray as a means or aid to diagnosis in all branches of medicine. In addition, the use of both superficial and deep radiation in therapy is taught.

The X-ray departments of the following hospitals are all fully equipped with modern diagnostic and therapeutic equipment and are available to fellows in radiology.

1. *University Hospital.* — Offers unusual clinical material of a chronic nature. There is an immense amount of material available in gastro-intestinal, chest, bone, and urological diagnosis. Unusual opportunity is given the student for pre-operative study of the case and post-operative study of the material removed at operation. The Dermatological Department furnishes a large number of both acute and chronic skin diseases for treatment.

2. *Minneapolis General Hospital.*— This institution offers an immense amount of material in acute and chronic diseases. There is an exceptional amount of work in acute respiratory and cardiac diseases. There is a very large fracture service in this institution.

3. *Glen Lake Sanatorium.* — This institution, with its 500 beds devoted to the treatment and diagnosis of all types of tuberculosis, offers the student excellent opportunity to follow both the clinical and radiologic course of the diseases while undergoing treatment. Routine X-ray examinations, both pulmonary and gastro-intestinal, are done on admission and at intervals during the patient's stay in the institution.

4. *Lymanhurst School.*—Routine physical and X-ray examinations of all school children suspected of having pulmonary tuberculosis are conducted at this institution. The student is given an unusual opportunity to correlate the physical and X-ray findings in childhood tuberculosis.

5. *The Cancer Hospital.*—This hospital, which will be available shortly, will be situated on the university campus and will have an initial capacity of fifty beds. It will be devoted entirely to deep roentgen ray and radium therapy. It will be fully equipped with the newest types of deep therapy machines. A radium emanation plant will be housed in this building. This institution will be run and staffed by the staff of the University Hospital. The student will here obtain unlimited experience in roentgen and radium therapy. He will also be taught the collection of radium emanation.

B. Courses Offered in the Mayo Foundation. Professor Russell D. Carman, M.D.; Associate Professor Alexander B.

Moore, M.D.; Instructors Harry H. Bowing, B.S., M.D., Albert Miller, M.D., Charles G. Sutherland, M.B., A. U. Desjardins, M.D.

The opportunities offered in radiology in the Mayo Foundation are designed to permit selected men to fit themselves for advanced work in this specialty. Unless the prospective fellow's preparation in normal anatomy, physiology, and pathology has been unusually good, at least a year should be spent in intensive study before entering on the special three years' course. The course in radiology covers every branch of work with the X-ray and radium as applied in medicine. All laboratories are modernly and thoroughly equipped. In addition to the routine work, seminars are held weekly in each division for the discussion of unusual problems and interesting cases. The library of the clinic and that of the department are well supplied with texts and journals dealing with radiology, and free use of these is expected. Individual research is encouraged in any radiologic problem which especially interests the student.

General Roentgenologic Technic. Practical instruction in the employment of all varieties of roentgenologic apparatus including transformers, vacuum tubes, tables, plates, films, intensifying screens, Bucky-Potter diaphragms, and developers, as used in roentgenography, stereoroentgenography, and roentgenoscopy. Dr. Carman, Dr. Moore, Dr. Sutherland.

Special Applications of Roentgenology. By assisting in the routine work of the laboratory the student is given abundant opportunity to become familiar with the roentgenography of the osseous system, chest, heart, lungs, and urinary system, and with the special technics required for accessory sinuses, mastoids, ventriculography, and pyelography. Unusual facilities and material are furnished for the roentgenoscopy and roentgenography of the gastro-intestinal tract. Dr. Carman, Dr. Moore, Dr. Miller, Dr. Sutherland.

Roentgen Therapy. The installation for roentgen therapy comprises four medium voltage machines and one high voltage machine, the latter operating two rooms simultaneously. Fellowship men have the privilege of examining patients having the various benign and malignant diseases to which roentgen treatment is applicable, and observing its effects, both early and late. Technics suitable for the various conditions are taught by practical demonstration. Instruction is given as to the mode of production, sequelæ, prevention and treatment of roentgen dermatitis; the causes, symptoms, and methods of minimizing radiation sickness, and the avoidance of danger from high tension currents. Dr. Desjardins.

Radium Therapy. Technics are demonstrated in the preparation and handling of radium tubes, needles, and plaques for therapeutic use, with methods of protection from professional injuries produced by radium. A large number of patients and an adequate supply of radium permit a practical exhibition of its application in general surgery, gynecology, ophthalmology, internal medicine, and diseases of the ductless glands, showing the biologic effects, reactions, and dosage. Dr. Bowing.

Physics of Radiology. A physical research laboratory is affiliated with the Department of Radiology, and the problems of this department constitute the major portion of the work done. Instruction is offered in electricity and magnetism, their phenomena, nature, and properties; sources of electric energy; types of currents, continuous and alternating; units of electric measurement, voltage, amperage, and wattage; the interrupterless transformer; vacuum tubes, types, penetration measurements. Training is offered in the use of instruments for measuring rays and for standardizing radiation apparatus. The physical laboratory is so situated that measurements can conveniently be made on the roentgen treatment machine. In the laboratory there is also a complete apparatus for radium emanations, with the necessary auxiliary measuring devices.

Interpretation of Roentgenologic Findings. This very important field of roent-

genology receives particular attention, and thorough training is given in the reading of plates and screen images, the recognition of normal and abnormal conditions, the roentgen signs of disease, both direct and indirect, roentgenologic differential diagnosis, the correlation of plate and screen findings, and the correlation of clinical and roentgenologic findings. In addition to the large current material, an extensive file of lantern slide reductions, exemplifying a wide variety of disease conditions, is accessible for study and comparison. Dr. Carman, Dr. Moore, Dr. Miller, Dr. Sutherland.

NEW YORK POST-GRADUATE MEDICAL SCHOOL AND HOSPITAL. Located at 301 East 20th Street, New York City. William D. Cutter, M.D., *Dean.*

Department of Roentgenology. Professor William H. Meyer, M.D., *Director;* Willard D. Duckworth, M.D., *Assistant Professor;* Roy D. Duckworth, M.D., Ignatz Kaufman, M.D., and Otto Glasser, Ph.D., *Associates;* Robert M. Colbert, M.D., Louis A. Milkman, M.D., *Instructors.*

The Department of Roentgenology has been enlarged and equipped with the most modern apparatus, which enables the School to offer the matriculant several comprehensive courses, as outlined below:

Course 801. Technic; interpretation; therapeutic application of X-rays. Two afternoons a week at 2:30; one afternoon at 1:30; fee, $100; six weeks. This course includes the principles and practice of roentgenology. A practical course in assembling, adjustment and control of apparatus. Operation and regulation of X-ray tubes. Posturing and exposure of patients. Laws governing exposure. Exposure tables and charts. Development and dark room technic. Principles of localization of foreign bodies, etc. The course is so arranged as to give the student a comprehensive knowledge of each step in technic, thereby making him self-reliant in developing personal technic with his own special apparatus.

Course 802. Basic fluoroscopy and plate interpretation. Three afternoons a week at 1:30; fee, $100; six weeks. This course comprises system in analysis, which is the keynote of successful interpretation of the complex roentgen picture, therefore especial stress is laid on pure analysis according to a definite scheme suited to the case in hand. Each organ is studied, first, in the normal, then in its varying pathological conditions. The course offers a general and comprehensive survey of the entire field of roentgenology, including diseases of the lungs and heart. Gastro-intestinal examinations occupy a large portion of the time; also roentgenology of bone and joint diseases. The genito-urinary tract, diseases of the skull, accessory sinuses and the teeth receive special attention in routine order as material presents.

Courses 801 and 802 may be combined. Fee for the combined course, $175; classes limited to eight matriculants; minimum number in a class, four.

Course 803. Advanced fluoroscopy and interpretation. Daily at 10:30 A. M., and three afternoons a week at 1:30; fee, $100; six weeks. This course is designed to permit the student to perfect himself in the interpretation of pathological conditions, in accordance with the plan outlined in Course 802. It should not be attempted without this fundamental knowledge. Students are called upon to give personal interpretation under the guidance of the Director. The class as a whole discusses the case, and as far as possible arrives at a diagnosis by elimination. This method brings out many points that would not otherwise be considered, and has proven of great value. The class is in session from 10:30 A. M. to 4:30 P. M.

Course 804. Roentgen therapy. Two afternoons a week at 2:30; one afternoon a week at 1:30; also on selected days at 10:30 A. M.; fee, $100; six weeks. The course is divided into three parts, as follows: (*a*) Lectures reviewing the essentials in Course 801, with special reference to their adaptation in roentgen therapy. (*b*)

Determination and measurement of quantity and quality; laws governing dosage, with tables and charts; ray complex, transmission and absorption; filters and their effect; secondary rays, etc.; action of radiation on normal and pathological tissues. (*c*) Technic in treatment of superficial and deep lesions and systemic diseases; fractional and intensive dosage—where and how applied; multiple area cross-fire method in deep roentgen therapy. This course is recommended only to those who have completed Course 801, or who have had its equivalent in experience.

Courses 803 and 804 may be combined in a six weeks' period. Fee for the combined course, $175. Available to those who have satisfactorily completed Courses 801 and 802. Classes limited to eight matriculants; minimum, four.

Course 805. Biophysics of radiation. Three afternoons a week, 3:30 to 5:30 P. M., for a period of six weeks, or by special arrangement. Fee, $100. The course consists of lectures and demonstrations dealing with the construction of modern high tension apparatus and tubes, the properties of various protective materials, etc. Discussion of the atom and electron; absorption and scattering; problems of absolute and effective dosage; absorption, energy, and ionization; standardization of dosage; biologic effects of radiation and their therapeutic value. This course is given during the last half of each quarter, alternating with the basic therapy course. It also is included in Course 806.

Course 806. Three months; daily, from 10 A. M. to 4:30 P. M. Fee, $200. This course offers the matriculant an opportunity to perfect himself in X-ray technic. Students are permitted to make their own fluoroscopic and radiographic examinations and administer treatments. The course includes instruction in the organization and management of laboratories, and special methods of examination, such as orthodiagraphy, Sweet method of localization, etc. Upon the satisfactory completion of a full six months' course, an assistantship in the department will be offered to a limited number of matriculants at a moderate salary.

During the past fiscal year 7,872 patients were examined in the department and 36,866 radiographic and fluoroscopic examinations were made. Two thousand one hundred and twenty-one X-ray treatments were administered to 1,153 patients. A classification of the cases seen during the year ending December 31, 1924, is as follows:

Circulatory diseases	159
Respiratory diseases	1,504
Gastro-intestinal diseases	1,007
Urinary diseases	750
Joint diseases	657
Bone diseases	2,517
Fracture cases	1,061
Dislocations	94
Foreign bodies	123
Roentgenotherapy	1,153

In the radiographic department, the increased space and new apparatus installed have permitted very great expansion of the work. In the therapy department, the introduction of a new technic has been responsible for the diminution in the number of treatments given, due to the fact that, with the new system, the time of exposure in each case is reckoned in hours instead of minutes.

UNIVERSITY AND BELLEVUE HOSPITAL MEDICAL COLLEGE, NEW YORK UNIVERSITY. Located at 338 East 26th Street, New York City. Samuel A. Brown, M.D., *Dean.*

Edward N. Gibbs Memorial X-ray Laboratory. Through the generosity of friends of the College and in recognition of the medical services rendered to the late Edward N. Gibbs by members of the Bellevue Hospital medical staff, there has been established in connection with the college clinic the Edward N. Gibbs X-ray Laboratory. The first Director of the Laboratory was Dr. Eugene W. Caldwell, 1900-1910. It has been put under the administration of the college clinic and is conducted to aid the medical and surgical staffs of Bellevue

Hospital and of the clinic in the diagnosis and study of obscure forms of disease among the patients under treatment in these institutions. The facilities of this laboratory will be used to illustrate the lectures on roentgenology. It is maintained in the highest degree of efficiency by the founders.

Courses in Roentgenology. Leon T. LeWald, M.D., *Director of Department of Roentgenology* and *Professor;* J. G. Boyes, M.D., *Assistant to Director* and *Instructor.*

A course of instruction in the use of the X-ray in medicine and surgery is given in the Edward N. Gibbs Memorial X-ray Laboratory.

Third Year—Lectures. One or more during the second half of the session on the relation between roentgenology and medicine. Professor LeWald.

Fourth Year—Lectures. One a week during the first half session. (1) History of roentgenology and demonstration of various forms of roentgen apparatus. (2) Interpretation of roentgenograms, paying especial attention to variation in normal anatomy and physiology. (3) Regional pathology as disclosed by roentgen examination, with especial stress on diagnosis of diseases of the digestive tract of children and adults. (4) Roentgenology in relation to the other specialties in medicine and surgery. Professor LeWald.

Laboratory Work and Section Teaching. Five times a week for a period of two weeks during the second half session at the Edward N. Gibbs Memorial X-ray Laboratory or Willard Parker Hospital. Technic of routine X-ray examination with interpretation of findings proven by surgical operation, autopsy, or prolonged clinical study, including various types of fractures, dislocations, malignant growths, foreign bodies, pathological changes of circulatory and respiratory systems, and lesions of the urinary and digestive tracts, etc. Fluoroscopic interpretations, especially relating to diseases of the chest and abdomen. Professor LeWald and Dr. Boyes.

Facilities. The College is fortunate in having the Edward N. Gibbs Memorial X-ray Laboratory established in the Carnegie laboratory extension. The laboratory contains a collection of instruments illustrating the development of the science of roentgenology, and is equipped with modern apparatus suitable for the diagnosis and study of obscure forms of disease by means of the X-ray.

Special and Graduate Courses. A post-graduate course is offered to a limited number of graduates of medical colleges who have had some experience in roentgenology, or who desire to specialize in roentgenology, or wish to use the roentgen ray for diagnostic purposes in connection with their work as internists or as specialists in gastro-enterology, etc. A short course is also given to students taking the three-year post-graduate course in the Department of Surgery. Professor LeWald and Dr. Boyes.

NORTHWESTERN UNIVERSITY MEDICAL SCHOOL. Located at Chicago, Illinois. Irving S. Cutter, B.Sc., D.Sc., M.D., *Dean.*

Department of Roentgenology. James T. Case, M.D., *Professor of Roentgenology;* Edward S. Blaine, M.D., *Associate Professor of Roentgenology;* Edward L. Jenkinson, M.D., *Assistant Professor of Roentgenology.*

(*a*) *Special lectures, fourth year.* Professor Case.

(*b*) *Lectures and demonstrations, fourth year, required.* One hour a week for thirty-three weeks, entire class. Professor Blaine.

(*c*) *Demonstrations, clinic, dispensary services.* Junior class. Two months, required. Total, twenty-four hours.

OHIO STATE UNIVERSITY COLLEGE OF MEDICINE. Located at Columbus, Ohio. Eugene F. McCampbell, S.B., Ph.D., M.D., *Dean.*

Course in Roentgenology (611, under Surgery). One or two credit hours. One quarter. Autumn, winter, spring. Three or six laboratory hours each week. Elec-

tive. Open to Juniors or Seniors. H. J. Means, M.D.

Practical demonstrations of plates are made in connection with the conference medical and surgical clinics and section ward-classes. Methods of X-ray diagnosis are shown, findings interpreted, and comparisons drawn with clinical findings.

UNIVERSITY OF OKLAHOMA SCHOOL OF MEDICINE. Located at Norman, Oklahoma (first and second years), and at Oklahoma City (third and fourth years). LeRoy Long, M.D., F.A.C.S., *Dean.*

Course in Dermatology, Electrotherapy, and Radiology. Including study of various forms of skin diseases, the application of electricity for the cure of diseases in general, and demonstration of the use of the X-ray for diagnostic purposes. Two lecture periods a week and ten periods of dispensary work during the first and second semesters.

Also X-ray examinations in *Course in Genito-urinary Surgery.*

This School has for twelve years been giving regular courses in radiology. In recent years Dr. Everett S. Lain and Dr. Marion M. Roland have been giving a total of four hours to Juniors and sixteen hours to Seniors in radiotherapy, including both radium and X-ray. In addition to this, the Seniors receive sixteen hours in radiography, including full technic, which is given by Dr. John E. Heatley, assistant in the Department of Dermatology and Radiology. It is the aim of the School that every class shall have a fundamental knowledge upon which they may later build themselves into practical radiologists, if they so desire.

UNIVERSITY OF PENNSYLVANIA GRADUATE SCHOOL OF MEDICINE. Located at Philadelphia, Pennsylvania. George H. Meeker, Ph.D., Sc.D., LL.D., *Dean.*

Courses in Radiology. Henry K. Pancoast, M.D., *Professor of Radiology;* George E. Pfahler, M.D., *Professor of Radiology.*

(First Year Course of Instruction in Medicine.) During the year Dr. Pfahler gives a course of lectures on radiology at the Medico-Chirurgical Hospital, illustrated by lantern slides and cases, covering radiologic studies of the cardiovascular, respiratory, gastro-intestinal, and urinary systems. Additional instruction in X-rays is provided by Dr. Pfahler, Dr. Pancoast and their assistants in connection with the various courses in clinical medicine. Dr. Pancoast gives a special course in radiology of the respiratory and gastro-intestinal tracts at the University Hospital.

(First Year Course of Instruction in Neuropsychiatry.) Radiographic diagnosis of nervous diseases is presented by Dr. Pfahler.

(First Year Course of Instruction in Dermatology-syphilology.) The department is provided with X-ray and other electrical apparatus for the treatment of diseases of the skin. Instruction is given concerning the dermatoses which are appropriate for radiotherapy and electrotherapy, and the technic of treatments is studied in detail. Student physicians who have acquired a sufficient knowledge of the technic are permitted from time to time, under supervision, to operate the apparatus and to administer treatments. They are also given the opportunity of visiting the Radiologic Department of Dr. Pfahler and observing the results of deep X-ray therapy. Supplementary instruction on X-ray therapeutics is given by Dr. Carroll S. Wright.

Department of Radiology. Henry K. Pancoast, M.D., *Professor of Radiology;* George E. Pfahler, M.D., *Professor of Radiology;* Bernard P. Widmann, M.D., *Assistant Professor of Radiology;* Ralph S. Bromer, M.D., *Associate in Radiology;* Robert A. Bradley, A.B., M.D., *Instructor in Radium Therapy;* Ernest Burvill-Holmes, M.D., *Instructor in Roentgen Diagnosis;* Eugene P. Pendergrass, M.D., *Instructor in Radiology;* Robert P. Sturr, M.D., *Instructor in Roentgenology;* James L.

Weatherwax, A.M., *Instructor in Radiotherapeutic Physics.*

Basic or Regular First Year Course of Instruction in Radiology. There is offered a twelve months' basic or regular first year course in radiology, limited to four student physicians.

For their major work in clinical radiology, the student physicians are separately and successively assigned for definite periods to three or more of the Radiology Departments of the Medico-Chirurgical, Polyclinic, University and Philadelphia General Hospitals — where they receive personal instruction from the various members of the faculty, and have ample opportunity for practical experience in the typical phases of clinical radiology.

Systematic courses of lectures covering the field of clinical radiology are conducted by Dr. Pfahler and Dr. Pancoast, assisted by Dr. Widmann and Dr. Pendergrass.

Radiologic clinical conferences are conducted in the Medico-Chirurgical and Polyclinic Hospitals by Dr. Pfahler; in the University and Philadelphia General Hospitals by Dr. Pancoast and the hospital staffs. Radium clinical conferences are conducted in the Philadelphia General Hospital by the staff of the radium clinic.

Seminars upon the theory of clinical radiology are conducted by Dr. Widmann and Dr. Pendergrass.

The physics of applied radiology is taught both theoretically and practically in the radiologic laboratories of the Philadelphia General Hospital by Mr. Weatherwax.

The course as a whole affords a unique opportunity for broad, systematic, basic training in the theory and practice of clinical radiology.

The following is a brief outline of the instructional schedule of the above course (for details as to hours, etc., see Bulletin, p. 73):

Clinical radiology. Dr. Pancoast (University Hospital).

Clinical radiology. Dr. Pfahler, Dr. Widmann, Dr. Sturr (Medico-Chirurgical and Polyclinic Hospitals); Dr. Pancoast and Dr. Pendergrass (University and Philadelphia Hospitals); Mr. Weatherwax and Dr. Bradley and Dr. Holmes (Philadelphia Hospital).

Radiologic conference. Dr. Pfahler (Medico-Chirurgical Hospital).

Radiology. Dr. Pfahler, Dr. Pancoast, Dr. Widmann and Dr. Pendergrass (Medico-Chirurgical Amphitheatre).

Biochemistry. G. H. Meeker, Ph.D., Sc.D., LL.D., W. H. Stoner, A.M., Phar.D., M.D., W. G. Karr, Ph.D., E. N. Cowan, M.D., Dr. Wilson, Dr. Pemberton and B. L. Oser, M.S. (Medical Laboratories).

Immunity, Biotherapy and Chemotherapy. J. A. Kolmer, M.D., Dr.P.H., Sc.D. (Medical Laboratories).

Psychophysiology of the Sensations, Feelings and Emotions. E. Lodholz, M.D. (Medical Laboratories).

Syphilology, General and Special. J. F. Schamberg, A.B., M.D., T. B. Holloway, M.S., M.D., Dr. Kolmer, G. M. Piersol, B.S., M.D., J. H. Stokes, A.B., M.D., B. A. Thomas, A.M., M.D., T. H. Weisenburg, M.D., S. S. Greenbaum, B.S., M.D., J. V. Klauder, M.D., C. H. deT. Shivers, M.D., and C. S. Wright, A.B., B.S., M.D. (Medico-Chirurgical Amphitheatre).

Electrocoagulation and Insertion of Radium Emanation. Dr. Pancoast (Philadelphia Hospital).

(Basic or Regular First Year Course of Instruction in Surgery.) Dr. Pfahler and Dr. Pancoast give instruction in radiology, including the interpretation of plates, bismuth and barium studies of the gastro-intestinal tract, radiotherapy, fulguration of tumors, etc. J. B. Carnett, M.D., demonstrates the operative and radiologic treatment of malignant tumors at a special clinic in the Philadelphia General Hospital.

Radiology. Dr. Pfahler, Dr. Pancoast, Dr. Widmann and Dr. Pendergrass (Medico-Chirurgical Amphitheatre).

Radium Clinic. Dr. Carnett (Philadelphia Hospital).

(Basic or Regular First Year Course of Instruction in Gynecology-Obstetrics.) Included in the course is a series of demonstrations of the use of the X-ray and radium insofar as they relate to gynecology.

Radiology. Dr. Pfahler, Dr. Pancoast, Dr. Widmann and Dr. Pendergrass (Medico-Chirurgical Amphitheatre).

Radium Clinic. C. C. Norris, M.D. (Philadelphia Hospital).

(Basic or Regular First Year Course of Instruction in Orthopedics.) Practical instruction in reading radiograms of bone and joint lesions.

Radiology. Dr. Pfahler and staff (Polyclinic Hospital).

Radiology. Dr. Pfahler, Dr. Pancoast, Dr. Widmann and Dr. Pendergrass (Medico-Chirurgical Amphitheatre).

X-ray Conference. Dr. Pfahler (Polyclinic Hospital).

(Basic or Regular First Year Course of Instruction in Urology.) Instruction is given by L. F. Milliken, M.D., D.Sc. (Med.), in quantitative colorimetric determinations of indigocarmin and phenolsulphonephthalein. After becoming experienced in the technic, the student physician performs these tests upon ward patients.

Radiology has assumed such prominence in urology that special efforts have been made to enable the student physician to familiarize himself with the theory and technic of urologic radiology and the reading and interpretation of radiograms of the urologic tract. Dr. Pfahler gives instruction in clinical radiology, including the exhibition of a large number of lantern slides. Dr. Pancoast furnishes exceptional opportunities at the University Hospital for the study of radiologic technic and plate interpretation.

Dr. Carnett, at the Philadelphia Hospital, gives a three months' course in the theory and technic of the application of radium in the treatment of carcinoma surgically.

Radiology. Dr. Pfahler, Dr. Pancoast, Dr. Widmann and Dr. Pendergrass (Medico-Chirurgical Amphitheatre).

Radium Clinic. Dr. Carnett (Philadelphia Hospital).

Urologic Radiology. Dr. Pancoast (University Hospital).

(Basic or Regular First Year Course of Instruction in Ophthalmology.) Dr. Pancoast gives a course of lectures and demonstrations on the general principles of radiology, including the localization of foreign bodies, treatment of malignant growths, accessory sinuses and teeth, cranial bones and tumors, and use of radium in ophthalmology.

Radiology. Dr. Pfahler, Dr. Pancoast, Dr. Widmann and Dr. Pendergrass (Medico-Chirurgical Amphitheatre).

X-ray, Radium, and Localization of Foreign Bodies. Dr. Pancoast (University Hospital).

(Basic or Regular First Year Course of Instruction in Otolaryngology.) Dr. Pfahler, Dr. Pancoast, Dr. Widmann and Dr. Pendergrass give an illustrated lecture course in radiology, including general principles of radiology, examinations of the nasal accessory sinuses, mastoids, etc.

Radiology. Dr. Pfahler, Dr. Pancoast, Dr. Widmann and Dr. Pendergrass (Medico-Chirurgical Amphitheatre).

Radium Clinic. Philadelphia Hospital.

Clinical Radium Therapy. Dr. Pancoast (Philadelphia Hospital).

Personal Courses. (4) *Gastroenterology:* In this course approximately four hours a week are devoted to the fluoroscopic examination of the stomach and intestines. (7) *Electrotherapeutics*, William T. Johnson, A.B., M.D. (Polyclinic Hospital). Principles and practical work, with special attention to technic.

PETER BENT BRIGHAM HOSPITAL. Located at 721 Huntington Avenue, Boston, 17, Massachusetts. M. C. Sosman, M.D., Roentgenologist.

This is not a set or didactic course, but an opportunity to observe all of the routine

work in the X-ray Department, both diagnostic and therapeutic. Attendance at staff rounds, operations and autopsies on the cases seen in the department is customary. Limited to two men a month.

This is a course for post-graduates, and is given during the summer months. In addition, there are opportunities for two men each year to serve as house-officers for a period of twelve months. The requisites for admission to this course are a diploma from a Class A school and one year's hospital work in an acceptable institution. These men have the status of an Assistant Resident and receive the usual perquisites of house-officers.

POST-GRADUATE MEDICAL SCHOOL. Located at 2400 South Dearborn Street, Chicago, Illinois.

Requirements for Admission. — Physicians will be registered for courses without examination upon furnishing satisfactory credentials. No male applicants will be accepted for any of the courses except licensed physicians in medicine.

Course No. 1. X-ray Diagnosis for Physicians Only.—A short, practical course in X-ray diagnosis has been arranged for physicians desiring special instruction in diagnosis, with the aid of the X-ray. This course includes lectures and personal instruction in the diagnosis of pathologic lesions demonstrated by the X-ray. The course is equally adapted to the general practitioner who wishes to do his own X-ray work, as an aid to his general practice, and to the specialist in X-ray work, who may not have had the advantage of a large amount of clinical material and now desires a short post-graduate course in diagnosis. Only graduates in medicine may take up this work, it being entirely diagnostic. In order to read X-ray shadows of the human body intelligently, one should have the foundation obtained in medical training, which furnishes the student with a knowledge of anatomy, pathology, osteology, the viscera, circulatory system and physiology. Without this foundation X-ray interpretation is of little value and very uncertain results are secured to the patient when interpretations of X-ray films or of fluoroscopic examinations are made by X-ray operators who are not physicians.

In this special diagnostic course, no attention is paid to the technical aspect of the work, such as the use of X-ray apparatus, exposure time, handling of X-ray tubes and dark room technic, except as such technic may apply to diagnostic principles and shadows shown on screen or film. It is obvious that a technical training in the entire field of roentgenology could not be given in such a short time.

The duration of this course is two weeks, working daily in the X-ray laboratory from 10 A. M. to 3 P. M., except Saturdays and Sundays. Ten A. M. to 11 A. M. film-reading on selected diagnostic films from our film library, covering the entire field of roentgenology. Eleven A. M. to 12:30 P. M. screen reading, fluoroscopic examination of gastro-intestinal and chest cases. From 12:30 to 1 P. M. reading of films taken in laboratory the day preceding. The work in this course is completed by lectures with film and lantern slide demonstration, covering the entire subject of roentgen-ray diagnosis, daily from 1:30 to 3:00 P. M.

The average busy doctor seeking this special line of post-graduate work finds two weeks the most convenient length of time for the pursuit of his studies. The fee for this course is $100.

If the physician wishes, this course may be combined with the special course in technic, which will occupy the time daily from 9 A. M. to 4 P. M., or can include the course in X-ray therapy from 2 to 5 P. M., spending the balance of the day in the pursuit of other branches of work, medical or surgical, in the general clinics, provided by the Post Graduate Medical School or at other institutions, if desired. Special arrangements may be made and information in regard to fee for combining of courses obtained.

Course No. 2. X-ray Therapy for Physicians Only.—A special short course cover-

ing X-ray therapy has been arranged for physicians desiring to give special attention to this phase of X-ray work. This includes lectures, demonstration of cases and practical work by the student in the treatment of superficial and deep pathologic lesions. In this course the student is allowed to manipulate machines, tubes, and render treatment to patients, under the supervision of the director of the X-ray laboratory. A practical technic is given to the student, the principles and factors entering into the technic explained, and all classes of cases demonstrated. The subjects being drawn from our abundant supply of clinical material include such cases as acne, eczema, deep therapy treatment of tonsils, menorrhagia, leukemia, glandular diseases, thyroidism and malignancy. This course covers a period of from two to three weeks from 2 to 5 P. M. daily, the second, third and fourth weeks of each month, instruction starting the first day of the second week. The fee for the course in therapy is $75 for three weeks and $100 for four weeks.

This course may be combined with Course No. 1 or Course No. 3, or with both Courses No. 1 and No. 3, by making special arrangements. It will be understood that this course can be given only to those having had previous training and experience in the operation of X-ray machines and tubes. Those not having had this experience may combine the course in technic with the course in therapy. This special instruction in therapy is limited to physicians only.

Course No. 3. Complete X-ray Course for Physicians.—For physicians desiring to do their own work. Training in technic, therapy and diagnosis. Duration, three to six months. A general course in roentgenology has been arranged for physicians who wish to do their own X-ray work. A special effort has been made to arrange a practical course, including lectures and demonstration of the physics, mechanics, chemistry and photographic principles pertaining to the manipulation of electrical currents, X-ray machines, X-ray tubes, both Coolidge and gas, dark room work, handling of films, intensifying screens, taking of stereoscopic films and their interpretation in the stereoscope, developing of films and making up of solutions for dark room purposes, exposing and developing of films, fluoroscopy, therapy, explanation of the factors entering into the technic for exposures of films. The student is furnished with a practical technic, which can be used with any type of X-ray apparatus or tube. This course includes the use of a complete roentgen-ray library, by means of which the student is taught the value of proper exposures; the difference between properly exposed films and ones improperly exposed. All the proper positions for the work are demonstrated to the student and he is gradually taught to do the work himself under the supervision of the technician in charge of the laboratory. This course covers the fundamental details and principles of the work and includes all that the physician should know to enable him to do roentgen-ray work. The laboratory is equipped with the most up-to-date apparatus obtainable, including large transformers with autotransformer control, both Coolidge and gas tubes. The use of all varieties of films, double screen technic, Bucky diaphragm, etc., is demonstrated.

In addition, if desired, the students are given instruction in arranging a special filing system for films. They are taught the practical application of this system, the keeping of records and card indices pertaining to the cases handled so that they will be able to keep a complete record of all films taken.

Diagnosis and therapy are included in this course.

It requires at least eight to twelve weeks to get the fundamentals of this course. The busy physician can arrange, however, to take two to four weeks covering as much as possible in that time, although we advise at least eight weeks' work. Fee for 24 weeks of this course, $450; for 12 weeks, $250; for 8 weeks, $200; for 6 weeks, $165; for 4 weeks, $115; for less than 4

weeks' time, $30 per week. The physician taking four weeks or longer of Course No. 3 will have Courses Nos. 1 and 2 included in the work without extra charge, but those taking less than four weeks' instruction of Course No. 3 and desiring Course No. 1 or Course No. 2 will have to pay the regular fee for the additional course or courses, together with a weekly fee for the technical instruction. Special arrangements can be made with the office to pay $50 per week for special instruction covering all courses given; for a short course of from two to four weeks. This opportunity is given only to physicians who are pressed for time, and is not extended to technicians.

The physician wishing to get new points on technic may combine Course No. 1 in X-ray diagnosis with Course No. 2 in X-ray therapy, or both of those courses, together with Course No. 3 in technic, and take one or two weeks of the technical work if he so desires. Fee $50 per week, including diagnosis for physicians.

Course No. 4. X-ray Course for X-ray Operators and Technicians, Females Only.—A general course for those desiring to act as technical assistants to physicians in roentgen-ray work has been arranged for technicians and X-ray operators. (Details upon application.)

Course No. 5. Special Intensive Course for Physicians.—For physicians desiring a very intensive training in all forms of roentgen-ray work, technic, therapy, pneumoperitoneum, X-ray interpretation of films and fluoroscopy, while acting as assistant to director of X-ray laboratory, a one-year period of training is given. Application must be made at least two months in advance of entering the work in order to secure a place in the class. This course is arranged for those desiring to make a specialty of roentgen-ray work in all its branches. It has the advantage of allowing the student to come in close contact with all details of the work. Fee for this course, $600.

From two to three students from this group may be taken into the organization as assistants toward the end of their training. A small salary will be paid, thus reducing the cost to the student.

Course No. 6. Special Intensive Course for Technicians, Females Only.—For those desiring a complete training, including practical experience acting as assistant in the laboratory, a special intensive course has been arranged. (Details upon application.)

Course No. 7. For Physicians Only.—This course has been arranged for the physician doing general practice, who does not care to do any X-ray work or learn the principles of technic or diagnosis except the interpretation or reading of the finished X-ray film. It is specially arranged for those desiring enough knowledge of X-ray work to be able to recognize what certain pathologic lesions should look like on an X-ray film. It will give those interested some idea of the range of possibilities in X-ray diagnosis. For physicians and surgeons desiring work of this kind a special course has been arranged from 1:30 to 3:00 P. M. daily, except Saturdays and Sundays. In this course the entire field of X-ray diagnosis is covered and fully illustrated with films and lantern slides showing all the pathologic lesions possible to diagnose by means of the X-ray film, with the points of diagnosis by the X-ray film fully explained. Fee $35 to $50, depending on length of time.

This course may be combined with any of those previously listed, by making arrangements at the office, and is given regularly the first two weeks of each month. It is included without extra charge in Courses Nos. 1 and 3.

ST. LOUIS UNIVERSITY SCHOOL OF MEDICINE. Located at 1402 South Grand Boulevard, St. Louis, Missouri. H. W. Loeb, A.M., M.D., LL.D., *Dean.*

Course in Radiology. LeRoy Sante, M.D., *Associate Professor;* Joseph C. Peden, M.D., *Instructor;* Edward H. Kessler, M.D., *Instructor;* Paul F. Titterington,

A.B., M.D., *Assistant;* Lex McCutchen, M.D., *Assistant.*

The instruction in radiology consists of lectures and demonstrations on the principles of radiology and the interpretation of plates (Junior year). The fluoroscope is used in co-operation with the Department of Physiology to demonstrate the action of the respiratory, cardiac and digestive organs. The large collection of X-ray plates in the Roentgenographic Department of the City Hospital is used for teaching purposes. Lectures, demonstrations, and quizzes, two hours a week, second semester. Professor Sante and Assistants.

There will be a three weeks' *Summer Course in Radiology*, beginning the first Monday in June, 1926, at the St. Louis City Hospital. It will cover physics of X-ray, technic, interpretation of bone pathology (especially injuries), chest, gastro-intestinal and all types of diagnostic work. Also, a few lectures on therapy—both X-ray and radium—will be given. Abundant clinical material is afforded; a large number of films and from one to two hundred examinations are made daily. This course will be given to physicians only, and its purpose is to acquaint the general practitioner with the scope and possibilities of the X-ray and radium.

STANFORD UNIVERSITY SCHOOL OF MEDICINE. Located at San Francisco (2398 Sacramento Street) and Stanford University, California. William Ophüls, M.D., *Dean.*

Summer work for graduates in medicine. Dr. W. E. Chamberlain and Dr. R. R. Newell. Fee, $100 first month, $50 for each succeeding month.

Course for third year medical students. Course 217, lectures and section work. Two hours (22 hours), winter quarter.

Course for fourth year medical students. Course 227, section work. Given to sections of one-fourth the class. One hour (11 hours), spring quarter.

Elective course (7). Special work in consultation with the Division of Radiology. Either therapy or diagnosis may be followed. Hours to be arranged.

Elective course (8). Experience in actual use of the fluoroscope. Limited to two students per section, five sections. Hours to be arranged.

Department of Surgery, Course 202, Fractures and Dislocations, includes study of X-ray plates.

Physicians as special workers in Radiology Department during the whole year. Fee, $100 for first month and $50 for each month thereafter.

UNIVERSITY OF TEXAS, MEDICAL BRANCH. Located at Galveston, Texas. William Keiller, L.R.C.P. and S. Ed., F.R.C.S. Ed., *Dean.*

Course in Roentgenology, Senior Year, Elective. J. B. Johnson, M.D., *Instructor.* Two hours a week for fifteen weeks. The first portion of the course comprises lectures, demonstration of plates showing bone injuries and bone and joint diseases. The latter portion of the course consists of X-ray study of pathological lesions of lung, heart, aorta, stomach, intestines, and other organs, including the study and interpretation of X-ray plates, fluoroscopic study of stomach, intestines, and kidneys.

In addition to the regular course in radiography, the general principles of radiotherapy are taught. In conjunction with the Department of Dermatology, treatment is given to patients having pathological lesions and skin diseases which are amenable to X-ray treatment, so that students have an opportunity to observe results.

A large number of cases in the medical and surgical clinics are referred for X-ray examination. The result of the examination, as shown by plates, is interpreted and demonstrated to the classes in the amphitheatre, while the physical signs and symptoms of the patient presented are being discussed, thereby giving the class opportunity to compare and study the X-ray findings

with symptoms. This extends through the Senior course.

Clinical cases assigned to students for case-taking in the wards, which have been referred for X-ray examination, are carefully studied, and the X-ray findings shown and explained to the student in the laboratory at any time during the Senior course.

TUFTS COLLEGE MEDICAL SCHOOL. Located at 416 Huntington Avenue, Boston, Massachusetts. Stephen Rushmore, A.B., M.D., *Dean.*

The undergraduate course given during the fourth year consists of thirty-three didactic hours covering a careful review of the physics and principles of electricity practically applied in roentgenology, the scope of roentgenology in diagnosis and treatment, its possibilities and limitations. Special emphasis is laid upon this branch of medicine being a handmaid to the other specialties, that by its means alone a correct diagnosis may often be made, but that diagnosis in general is a group problem, and X-ray diagnosis, while most valuable, must not be overestimated, but accept its rightful place in medicine.

Realizing that many of the students who accept internship at the smaller hospitals will be expected to do a certain amount of routine X-ray work, enough technic is given to familiarize such students with the subject.

Written and oral quizzes are regularly utilized. Lantern slides, prints and X-ray negatives in abundance are demonstrated throughout the course. Actual clinical demonstrations of the photographic and fluoroscopic screen methods of X-ray examinations and X-ray therapy are given at the Boston City Hospital and Boston Consumptives' Hospital to third and fourth year students. Facilities are available for those desiring graduate work in this subject upon presentation of proper qualifications. F. W. O'Brien, A.B., M.D., and F. E. Wheatley, A.B., M.D.

TULANE UNIVERSITY OF LOUISIANA SCHOOL OF MEDICINE. Located in New Orleans. C. C. Bass, M.D., *Dean*, 1551 Canal St., New Orleans.

Department of Medicine, second year: Physical Diagnosis. In the practical course accurate technic and familiarity with the normal signs are the aims. Physical diagnosis of the lungs, heart, diaphragm and digestive tract is taught in conjunction with the use of the X-ray. Knowledge of the normal and variations from the normal is increased by visualization of the fluoroscopic and skiagraphic images of the parts under consideration. The X-ray demonstrations are conducted by Dr. Leon J. Menville.

Course in Radiology, fourth year. Dr. Adolph DeC. Henriques demonstrates the use of the X-ray and radium in diagnosis and therapy. The indications, limitations and dangers of these agents are discussed. Through the courtesy of the Boards of the Charity Hospital and the Touro Infirmary, and with the co-operation of the staffs of these laboratories (Dr. Amédée Granger and Dr. Donald, at the Charity; Dr. E. C. Samuel and Dr. E. R. Bowie, at the Touro), students working in these institutions have the opportunity of making use of X-ray methods in the study of their patients.

Course in Fractures and Dislocations, fourth year. The large outdoor Surgical Clinic of the Touro Infirmary, aided by a well-equipped X-ray laboratory, provides ample material for the study of bone and joint lesions.

Course in Roentgen Diagnosis, fourth year. Through the courtesy of the administrators of the Charity Hospital and of the Touro Infirmary, and with the co-operation of the staffs of these laboratories (Dr. Amédée Granger, at the Charity; Dr. W. F. Henderson, at the Touro), students working in these institutions have the opportunity of making use of X-ray methods in the study of their patients.

WASHINGTON UNIVERSITY SCHOOL OF MEDICINE. Located at St. Louis, Missouri. McKim Marriott, M.D., *Dean.*

Course in Roentgenology. Sherwood Moore, M.D., *Associate in Surgery (Radiology) and Director of X-ray Laboratory, Barnes Hospital;* Oscar C. Zink, M.D., *Assistant in Surgery (Radiology),* and Joseph W. Larimore, M.D., *Instructor in Clinical Medicine and Assistant Roentgenologist (Gastro-enterology).* Elective course to Seniors, one hour daily throughout entire year.

WESTERN RESERVE MEDICAL SCHOOL. Located at Cleveland, Ohio. Carl A. Hamann, M.D., F.A.C.S., *Dean.*

Roentgenology is taught as a subdivision of the Department of Surgery. Its teaching begins in the first year in the Department of Anatomy, where Professor T. W. Todd, M.B., Ch.B., F.R.C.S. (Eng.), teaches the anatomy of the gastro-intestinal tract by means of X-ray studies upon the students themselves. They also get some visualization of bones while they are in this field. In the second year course a short talk is given on the principles of X-ray diagnosis. In the third year a series of lectures elaborates upon the principles and applications of X-ray to clinical medicine, and the study of the body as revealed by it is taken up systematically. In the fourth year, while the students are clinical clerks, one afternoon a week a small group of students in the fluoroscopic room learns the particular use of this branch of roentgenology.

This scheme may be said to cover the real teaching of roentgenology, but, of course, every clinician who uses the X-ray plays a certain rôle in the education of the students.

UNIVERSITY OF WISCONSIN MEDICAL SCHOOL. Located at Madison, Wisconsin. C. R. Bardeen, B.A., M.D., *Dean.*

Courses in Radiology. J. N. Sisk, B.Sc., M.D., *Clinical Instructor.* (104) X-ray Technic: (320) Radiology: (405) Fourth Year Radiology.

AMERICAN COLLEGE OF SURGEONS

The Hospital Standardization Report for 1925 publishes the following statements and recommendations concerning "The X-ray Department":

"Hospitals continue to improve their X-ray service. Many new departments with modern equipment have been added during the last year. The range of use, as an adjunct in clinical medicine through newer technic, is broadening from year to year.

"The following may be regarded as a minimum requirement of X-ray service in an approved hospital:

"*Location.*—The old idea of the basement location for this department is passing and to-day nothing lower than the ground floor should be acceptable. Many hospitals place the department in close proximity to the operating rooms, . . . This has many advantages, especially in regard to better co-operation between the clinician and the radiologist, as well as in the examination of certain types of cases not readily or safely transported. However, in planning this department due consideration should be given to accessibility for doctors and patients. This is a matter of study for each individual institution.

"*Accommodation.*—Proper lighting and ventilation are necessary. Freedom from dampness and proper protection from electrical and X-ray dangers must be duly regarded. The necessary rooms or divisions required for the comfort of the patient and the expedition of the work should be provided. Hospitals planning X-ray departments would do well to make a careful study of the problem and seek experienced advice on plans which in the end would provide maximum comfort for the patient and efficiency in operating the department. A proper layout will save time and energy, and greatly increase the volume of work.

"*Protection.* — Definite means must be taken to protect the patient, the operator, and others in the department. The American College of Surgeons recommends that hospital authorities acquaint themselves with the nineteen recommendations compiled by the Safety Committee of the American Roentgen Ray Society, appearing in the April, 1925, *Bulletin of the American College of Surgeons*, Vol. IX, No. 1, pp. 97 and 98, as submitted by James T. Case, M.D., Battle Creek, Michigan, Professor of Roentgenology, Northwestern University Medical School, and surgeon to the Battle Creek Sanatorium. A copy of these suggestions will be sent by the Hospital Information and Service Department of the American College of Surgeons upon request. Observation of these regulations will tend to prevent accidents and damage suits against hospitals.

"*Minimum Floor Space Required.*—(*a*) For hospitals of from 50 to 100 beds, at least 400 square feet. (*b*) For hospitals of from 100 to 150 beds, at least 650 square feet. (*c*) For hospitals of 150 beds and up, 1,200 to 3,000 square feet.

"*Equipment.* — The X-ray department should be organized to do radiographic and fluoroscopic work at least. X-ray therapy is advisable when possible and practical. Dr. Case says that the following is regarded as the minimum equipment for (*a*) a hospital of from 50 to 100 beds:

One interrupterless transformer, of 5 kw. or more capacity, with both rheostat and autotransformer control, and preferably with 2 mm.

Coolidge tubes, of universal and radiator type.

Upright and horizontal fluoroscope and X-ray table equipped with tube stand, or a combination tilt table with facilities for fluoroscopic and radiographic work above and below the table and in the vertical position.

One Potter-Bucky diaphragm, preferably attached permanently to the X-ray table.

Upright plate changer for stereoscopic chest work (this also may be incorporated in the combination table).

Tunnel plate changer for ordinary stereoscopic work.

Stereoscope and viewing box.

Two or more cassettes of each of the following sizes: 8 x 10 inches, 10 x 12 inches, and 14 x 17 inches, with permanently attached intensifying screens.

One set of dark room equipment.

Lead rubber protective gloves, aprons, goggles, time clock, and minor accessories.

"(*b*) Hospitals of 100 beds and over:

A more powerful interrupterless transformer than above noted.

Where therapeutic work is approved and a properly trained medical radiologist is available, 200,000-volt X-ray equipment for deep therapy may be added.

A minimum of 650 square feet floor space.

Table with Potter-Bucky diaphragm permanently attached is highly desirable.

Intensifying screens; 6 cassettes, 8 x 10 inches; 6 cassettes, 10 x 12 inches; 4 cassettes, 14 x 17 inches; all double and permanently attached.

Eye localizer and charts.

Fluoroscopic bonnet for foreign body and fracture manipulations necessary in operating room.

"Every hospital should have a portable X-ray machine, particularly for non-transportable patients. This is necessary for a large percentage of patients in any active hospital.

"*Personnel.*—There should be the necessary supervising, technical, and janitor personnel. The American College of Surgeons requires supervision through a medical radiologist in all instances. This is essential from the standpoint of administration and development of the department, the carrying on of complicated technic, and, particularly, the accurate interpretation of findings. Quoting again from Dr. Case, he says, in part, in support of the above recommendation:

Even in those small communities where it is as yet impossible to find a man specializing in roentgenology to take charge of the hospital X-ray work, it is quite feasible for the members of the staff to pool their interests and select one of their number to devote special attention to this matter, and take definite steps to improve his ability to interpret X-ray findings. As already mentioned, it is out of the question to consider the matter of X-ray treatment by anyone not a physician, and no physician in his right mind will dare to undertake X-ray therapy unless he has had special training in this work. Otherwise one of two things is almost sure to happen: Either he will lean so far to the safe side that his therapeutic endeavors will have little or no effect, or else he will damage enough patients to shortly put an end to his therapeutic essays.[1]

"*Records.* — Proper forms for requisitioning and reporting findings are essential. Duplicate copies, at least, of reports of findings should be made, the original going to the patient's file, the copy to be kept in the department. The majority of X-ray departments to-day have well organized X-ray record systems, including not only the reports referred to, but a cross-index giving at least the following information: (*a*) identification of the patient and the film by name and number; (*b*) cross-index, (1) anatomical part or region examined, (2) pathological or diseased condition revealed.

"The storage of X-ray films should receive careful consideration. There is a serious fire risk with the ordinary highly inflammable X-ray films unless properly protected and ventilated filing cabinets or vaults are used. Many communities have passed ordinances compelling hospitals to file these films in fireproof vaults or containers. A number of hospitals are using the non-inflammable film now available."

Dr. Case addressed the Hospital Conference held at Chicago, October 22 and 23, 1923, as follows:

THE FUNDAMENTAL REQUIREMENTS OF AN EFFICIENT X-RAY SERVICE IN HOSPITALS

"An X-ray department requires equipment more or less complete, according to the service it is expected to render. If it is expected merely to make 'pictures' of dislocations and fractures, possible kidney stones or other opaque foreign bodies, the thorax, and other conditions in all of which the referring physician or surgeon feels himself perfectly able to make the interpretation, the equipment and personnel need not be very extensive. If the staff desire to utilize the X-ray aid available in a well equipped hospital to the fullest degree possible under modern conditions, a

[1] See also "A Minimum Standard for X-ray Service in a Hospital," James T. Case, M.D., Radiology, Sept., 1925, p. 183.

generous equipment, plenty of space, and adequate personnel, both medical and technical, are absolutely necessary.

"1. *Equipment and Space.*—It is needless to list the individual roentgenologic instruments required other than to say that an adequate X-ray service demands the provision of the complete roentgenographic equipment (interrupterless transformer with the capacity of 75 or more milliamperes, tube stand, table, provision for stereoscopic roentgenograms of various parts, including the chest); fluoroscopic equipment for study in both the horizontal and vertical positions; viewing box; stereoscope, and a dark room for the loading and development of films. For occasional X-ray treatments the roentgenographic equipment may ordinarily be employed, but where there is much therapeutic work to be done, a separate room and separate equipment should be made available. Modern deep X-ray therapy requires the installation of an apparatus capable of delivering to the tube a minimum of four or five milliamperes at 200,000 volts.[2]

"There is now generally available generating apparatus not only capable of delivering the 200,000 volts at 5 milliamperes current needed for deep therapy, but also available for ordinary roentgenographic work, thus economizing space and apparatus. For small hospitals this generator may serve both the roentgenographic and the treatment rooms. There is no question but that the roentgenographic apparatus generally supplied up to three years ago (10-inch gap machines) may be employed satisfactorily for many X-ray therapeutic purposes, especially in the treatment of superficially seated malignancies, various skin lesions, tuberculous glands and joints, and certain blood disorders, and even in the treatment of fibroids and some other causes of menorrhagia; but for deep therapy, in its true sense as now employed at 200,000 volts or more, a specially constructed deep therapy apparatus must be supplied.

"The matter of intensifying screens is an item of no small importance in X-ray equipment. The initial outlay for screens is fairly expensive, but their careful and economical use leads to a very great saving in tubes and a very marked improvement in the quality of those exposures which must be done more or less instantaneously to be of value.

"The space in which to assemble and work the equipment is one to which too often only scant thought is given. Even in many of the larger hospitals to-day one finds all the different instruments above outlined crowded into such small space that it is difficult to pick one's way between the apparatus. It is a wonder that we hear of so few accidents occurring in X-ray departments. Some of these few, however, have been tragic. In some quarters there seems to be a hold-over of the idea of fifteen or twenty years ago that the X-ray department, being more or less analogous to the photographic department, requires only one or two rooms for its functioning; and as new equipment has been acquired, it is thrust into the old cramped quarters. Hospital directors who begrudge the space demanded by the roentgenologist would do well to visit such institutions as the Battle Creek Sanatorium, the Mayo Clinic, and the University Hospital at Ann Arbor, indeed, almost any one of the larger teaching hospitals, to realize the importance conceded to the X-rays as demonstrated by the generous space allotted to this department.

"It may be more or less tentatively stated as a minimum that a hospital of 50 beds should have at least 400 square feet of floor space devoted to X-ray work. Up to 150 beds, there should be not less than 650 square feet of floor space divided into rooms for treatment, roentgenography and fluoroscopy, dark room, and office. Larger hospitals should have from 1,200 to 3,000 square feet, including treatment rooms,

[2] Since August 1, 1923, I have had the privilege of employing the most powerful X-ray tube in the world. Thanks to the inventor we have the first water-cooled Coolidge tube released from the factory. This powerful tube permits the employment of up to 30 milliamperes at a maximum of 250,000 volts, sustained output, continuously from one tube. It is apparent that this type of tube bids fair to displace the air-cooled tube nowadays commonly employed in deep therapy.

roentgenographic and fluoroscopic rooms, office, film loading and developing room, film consulting room, filing room, lavatories, and waiting room, and a work room for mechanical developments. University and teaching hospitals need even more space for the provision of the necessary equipment for teaching purposes.

"It would be axiomatic to declare that no amount of luxurious equipment will make up for the lack of a competent physician-roentgenologist or that the roentgenologist cannot render a full measure of usefulness to the staff without adequate facilities. Furthermore, it is self-evident that the type and arrangement of the equipment will differ in the different classes of special hospitals, for the X-ray department is but one of the clinical diagnostic departments and the proper perspective must be maintained according to the ability of the hospital board to equip and staff its various sections.

"2. *Organization.*—The hospital of 50 beds or more should certainly have its physician specializing in roentgenology. He may be only the visiting roentgenologist, having other work elsewhere, and in smaller towns he will probably be a man who devotes only part of his time to roentgenology, combining it with nose and throat work, anesthesia, pathology, radium therapy, or some other specialty. There are in this country something like 2,000 hospitals of 50 beds or more. Are there available 2,000 physicians especially trained in roentgenological work who are willing to accept this very interesting specialty as their major work? In the evident absence of any such number of available roentgenologists, it is recognized that in many small hospitals, especially those situated in the smaller communities, no physician is available, however ideal it would be to have one. The staff send their patients for roentgenological study, each reading his own film records, and making his own fluoroscopic studies, if, indeed, any are made.

"It is manifestly impossible and unthinkable to permit or expect any one but a physician to undertake the interpretation of the roentgen findings with any hope of transmitting to the clinician all the help which the X-ray is capable of giving. There have been some notable exceptions to this statement, but they have numbered very few indeed; and with the ever-widening field of roentgen application the usefulness of any one but a graduate physician for roentgen interpretation is steadily decreasing. Even in the small community just referred to, where nowadays each physician makes his own interpretations, it would be not only ideal but in thorough sympathy with the principle of hospital standardization and mutual co-operation between physicians thereby involved, if the agreement could be reached that one of the physicians in the community should devote special attention to roentgen interpretation and act as consultant in this capacity. Even under these circumstances, the members of the hospital staff should not hesitate to avail themselves of consultation with roentgenologists more favorably situated in large centers whose opinion could be obtained by sending X-ray records and clinical data for consultation.

"A hospital of 150 beds or more should not be considered completely staffed without a physician-roentgenologist who devotes full time to his work. He may devote his services to more than one hospital, but his major time and thought should be devoted to perfecting himself in his roentgenological work and in reaching out into new lines of X-ray development. He may spend only a few hours a day in the hospital and the rest of his time in his office outside the hospital; or the hospital may wisely arrange for his private work to be conducted in the institution. Still larger hospitals doing general work should have the full-time services of a physician-roentgenologist. Especially in this type of institution the roentgenologist may advantageously combine his X-ray work with radium therapy and the various surgical procedures which are more commonly involved in the application of radium.

"3. *Technical Help.*—The X-ray technician should never attempt to extend his activities beyond the technical work into the domain of diagnosis. No matter how competent, it is manifestly no more proper for an X-ray technician to attempt the interpretation of X-ray findings than for a competent surgical nurse to undertake surgical operations. I have no doubt that there is here and there a surgical nurse who, under favorable conditions, could safely amputate a finger or a foot or even a limb, or remove the appendix; but this surgical nurse would be the last one to wish to undertake such a venture. Diagnostic work lies beyond the province of the technician whose interests and training should be centered on the care and manipulation of X-ray equipment. His or her time will be more than fully occupied with the problems of the ever sought but never attainable perfection in roentgenographic technic.

"Naturally the X-ray technician's work deals with roentgenography, not with fluoroscopy. A well trained technician will have a knowledge of the fundamentals of electricity, the principles of construction of the X-ray apparatus of various kinds and the care of the apparatus, the physics of light, a sufficient familiarity with anatomy to intelligently 'place' his patient for examination, and an accurate knowledge of the exposure and development of roentgenographic films. Proficiency in this technic was formerly much more difficult of attainment when gas tubes, mercury breaks and other forms of interrupters, coils and static machines were employed, but nowadays the X-ray equipment has become sufficiently standardized to permit standardization of roentgenographic technic.

"A concerted effort should be made to establish a standard of training for X-ray technicians, and provision should be made for proper certification of this training when it has been attained. The American College of Surgeons could, it seems to me, properly and very helpfully exert great influence in this matter. In the smaller hospitals, one technician will suffice for all the manipulative work in the X-ray department, and he or she may also be trained to do the clinical medical 'photography' needed in such a hospital. Larger hospitals have the technical work divided among several helpers. In the largest type of X-ray department there will be a place for a trained physicist to aid in the development of the technical X-ray work and guide in the technical aspects of research work in radium and roentgen therapy.

"4. *Interpretation of Findings.* — The technical work of the X-ray department, including the production of the roentgenograms and the setting in operation of the fluoroscope, is but the preparation for the real medical work of the X-ray department, its real *raison d'être*, namely, the interpretation of the findings. The work of interpretation constitutes medical roentgenology and it must be done by a physician. The better the technical work, the richer will be the roentgen findings in information for the medical roentgenologist to interpret. The greater his training, the richer his clinical experience, the fuller his devotion to his work, the more will the medical roentgenologist see in the film and screen records of the case. Some do the fluoroscopic examinations in a perfunctory manner because they obtain from them little help, but the enthusiastic, well trained, experienced clinical roentgenologist will find in the screen study of his patient a veritable mine of information, and his ingenuity will constantly show him ways to reach out into unexplored avenues.

"The average physician of to-day is not well fitted to undertake X-ray interpretation. This may be said even of many men into whose hands the roentgenological interpretation is at present confided, but there are outstanding figures scattered over the country, and by no means all of them connected with a large hospital, who are by nature, education, previous experience in pathology, surgical or clinical medicine, as well as special training in roentgenology, armed with the necessary clinical knowledge to aid them in their technical work.

"Unfortunately, there are in this country not many organizations interested in the preparation of roentgenologists. In England, the University of Cambridge and the University of Liverpool have now established courses covering a year, leading up to an examination and a diploma in medical radiology and electrology. I hope the day will come when similar arrangements will be provided in North America. It would be a great help, not only to roentgenology but to surgical and medical work in general, if three universities, say, for instance, Pennsylvania, Toronto, and California, would establish courses covering the necessary training in physics and technic and the clinical applications leading up to a similar diploma. The American College of Surgeons here, again, could render great service in sponsoring such a move.

"X-ray interpretation must be done by a physician who has had special training if the X-rays are to be utilized to the fullest degree. The gynecologist, for instance, in making a bimanual examination of the pelvic organs, visualizes what he feels. In his mind's eye, he pictures as an image in flesh and blood the mass which may be due to ovary, tube, fibroid, cyst, etc. In a similar way, the roentgenologist-interpreter must visualize in flesh and blood what he sees in shadow—not a defect, a displacement, a crater, an enlargement, a contraction, a thickening, a thinning, a light or a shadow, but the actual lesion. He must see the ulcer, the cancer, the tumor, the stricture, the cavity. This is relatively impossible without a basis of experience in pathology or surgery.

"The X-ray department is not engaged in work of a kind where the answer to the problem is found by looking up certain formulæ or watching for the development of certain reactions; for the reactions when obtained (*e.g.*, the film or screen image) will require interpretation. This takes the X-ray work out of the general class of laboratories and puts it among the examining departments such as the urologic, ophthalmologic, electro-cardiographic, etc. Indeed, it would be better if the term X-ray 'laboratory' were abolished and we spoke of the X-ray 'department' or the X-ray 'examining department.' The primary object of an X-ray department is not to make 'pictures,' but to supply information.

"Much of the work leading to the production of this information should be done with the fluoroscopic screen. We see much fluoroscopy done in a perfunctory manner without any real appreciation of the value of this method. In many hospitals the gloved hand of the examining physician is never placed beneath the fluoroscopic screen. The value of visualized palpation by the protected hand slipped under the fluoroscopic screen cannot be fully appreciated by one who has not done it. The ability to move the stomach, the bowel, to watch the excursions of the diaphragm, the beating of the heart, the ever-changing shadows, when one rotates a patient under the fluoroscopic screen, to observe the behavior of a joint or a fractured limb under fluoroscopic manipulation, all constitute advantages available under screen examination which cannot be overlooked or set aside. As hinted in an earlier paragraph, the circumstances may be such in some hospitals that the individual staff members must interpret their own findings, but here again I wish to suggest that the spirit of mutual self-help and co-operation will point a way by which at least one member of the staff can acquire special training for interpretation and assist his fellows in their work.

"In the light of what has been said, it is apparent that the interpretation will be all the more valuable and helpful if the roentgenologist is furnished with the history and such clinical data as are available up to the moment of the X-ray examination. The roentgenologist should not be treated as though he were perpetually on examination and each patient sent to him as a catch problem, but he should be looked upon as a colleague and be provided with every fact likely to assist him not only in the interpretation of the case in hand, but in his devel-

opment into a better, broader, and more useful clinician.

"5. *The Record.*—The record should be made in writing and should be furnished at least in triplicate—one copy for the attending physician, one copy for the X-ray department, and one copy for the hospital archives. Whether or not the patient acquires a copy of this report will depend upon the custom of the hospital. In the Battle Creek Sanatorium, we feel that the X-ray report should contain only such statements as are capable of substantiation by film or screen examination. In other words, although the roentgenologist is furnished with all available clinical data to aid him in his interpretations he must not in his written report break over the bounds of the roentgenological findings. The report, therefore, constitutes only a part of the clinical examination of the case and the roentgenological report, as such, has no business in the hands of the patient. The patient surely is entitled to a written summary of his case, this summary to be made by the clinician in charge of the case. In this summary, the X-ray report should find its proper place.

"To whom do the films or plates belong? Surely not to the patient, for he pays, not for a 'picture' but for an examination, and he is no more entitled to the 'pictures' than he is entitled to the cover slides containing the microscopic section of tissue in his case, nor the smears of blood used for making ordinary or differential blood counts. The X-ray films constitute only a part of the examination and really form a necessary part of the record. If we say that he is entitled to a copy of his X-ray 'pictures' merely because the X-ray records are capable of being printed, why not extend the idea and give the patient a photograph of the proctoscopic or vaginal examination or a photograph of the eyeground or the larynx or the pharynx? A relatively small outlay of cash will provide apparatus for making photographs in connection with proctoscopic, vaginal, cystoscopic and other similar examinations, and so on *ad absurdum.* As a matter of fact, the X-ray films belong to the hospital where the patient's records are kept. In sympathy with the plan of hospital standardization carried on by the American College of Surgeons, this should be made a rule. Prints or films in the hands of patients lead only to false interpretations, confusing opinions, multiplicity of advice, and bad results. Wise laws are being passed in a number of States and Provinces requiring the hospitals to retain their X-ray films for two years or more.

"A film library should be organized and cross-indexed. It would be a very valuable thing if every hospital would have a film library of, say, 600 or 1,000 films, the library to be limited to this number, the films properly sorted out and classified according to the pathological findings shown. I would suggest that the number of films be *strictly* limited and that no additions be made except where the additions are superior in quality or in rarity of the lesion to films already in the collection which will be discarded for the new ones. Such a library, cross-indexed and with suitable notes, will prove of great value to the staff in many ways.

"Frequent discussions concerning the work will be necessary and in my experience as regards X-ray work they are seldom lacking. A certain number of staff meetings each year should feature the roentgenological work. The science of roentgenology is almost as broad as medicine itself, and every department should participate in the discussions."

AMERICAN COLLEGE OF PHYSICIANS

The American College of Physicians was incorporated under the laws of Delaware, May 11, 1915. It was organized for the purposes of elevating and standardizing the practice of clinical medicine, of securing due recognition for internal medicine as a distinct and special division of the profession of medicine, of encouraging and maintaining ethical modes of practice and to further the many interests which medicine may have with the public.

At present there are approximately 950 Fellows of the College. Among these are about thirty of America's radiologists. These Fellows are, geographically, distributed widely throughout the various States of the United States and the Provinces of Canada. They comprise what might be considered a "picked" group, inasmuch as the majority are teachers, investigators or at the heads of important and nationally known laboratories, usually integral parts of representative institutions.

The American College of Physicians has always maintained a liberal attitude with respect to radiologists. Instead of looking upon such as mechanicians or technicians, the College has regarded them as consultants in diagnosis in a very highly specialized field of medicine. Accordingly, the College has endeavored to select as Fellows such men as have had high grade pre-medical and medical instruction and who have supplemented their undergraduate knowledge by clinical experience and by adequate technical training in approved laboratories and institutions. Especially, has the College encouraged the investigative aspect of radiology; indeed, in the selection of radiologists who are candidates for Fellowship, the contributions which such have made toward advancing the specialty, along theoretic or practical lines, in its relationship to diagnostic and clinical medicine, have always carried more weight than has the fact that such-and-such a candidate excelled in the number of "cases" or "exposures" he has had record of making.

Respecting the peculiar technical qualifications which allow one radiologist to rank higher than his fellows, in the opinion of these fellows, the College has not presumed itself sufficiently competent to be the judge. Rather, it has endeavored to have opinion relative to the worth of the candidate come from one or more sponsors in his own field, but has retained its freedom of action with regard to passing upon the general scheme of education and training of the candidate as shown by his record submitted upon the official application form.

Thus, it will be seen that the College, while friendly toward the specialty of radiology and willing to do all possible to cooperate in elevating and securing recognition for the specialty, as such, desires freedom of action in admitting radiologists to Fellowship. The radiologist desired as a Fellow of the American College of Physicians must have had the training which, first of all, is essential for qualifying him as a practitioner or teacher of clinical medicine. To this there must be added proof that, in the field of his specialty, he has done work—investigative or practical—which marks him as a true and dependable specialist. Ethically, he must be above reproach; particularly shall he not be in any way a part of a group or institution which is engaged in commercializing the results of scientific research. In all instances, must his contacts with his professional colleagues, his patients or the public be just and proper, beyond question.

The Constitution and By-laws of the College do not, at present, make special provisions for the admission of "radiologist" Fellows. Candidates are generally considered as internists who are directing their efforts along particular channels. It is quite probable that some broadening of the qualifications relative to admission to Fellowship will be made eventually to enable proper classification of candidates,—*e.g.*, radiologists, pathologists, bacteriologists,

etc. It is likely that a committee comprised of outstanding men from the specialty under discussion, will be called upon to formulate requirements for each group. This plan would mean a more reliable and comprehensive selection of men for Fellowship than is now possible. It is hoped that, should such a general scheme be formulated, the College will have the active support of representative radiologists.

FRANK SMITHIES, M.D.,
Secretary-General.

(See notice of American Congress on Internal Medicine, page 169.)

AMERICAN COLLEGE OF RADIOLOGY

By ALBERT SOILAND, M.D., *Secretary*

NO department of medicine or science has attracted more attention during the past two decades than X-rays and radium. The value of radiation is now fully established, and the medical man can hardly picture to himself what medical practice would be to-day without the assistance of these epoch-making discoveries in both diagnostic and therapeutic work.

Any new spectacular discovery or undertaking naturally attracts many seekers of notoriety, as well as investigators of questionable repute and mediocre ability. It was not surprising, therefore, that an army of these camp followers sprung up, both discrediting and hindering the work of conscientious and scientific students of the subject.

This is one of the strongest reasons for the organization of special societies of medical men, who, by legitimate study and research, may steadily widen the field of knowledge in regard to these sciences and distribute the knowledge thus gained, through proper channels, both to the medical profession and to the general public.

There are in America to-day three scientific bodies representing notable achievements,—the American Roentgen Ray Society, the American Radium Society, and the Radiological Society of North America. The service which has been rendered by these groups to organized medicine is very great, and their success has been attested by their rapid growth. To the writer, it had seemed that the time was ripe for the establishment of an institution which would help to bring about co-ordination of the work of the above-named societies, and which, to this end, would include in its personnel, members of all radiological groups of recognized standing. Over a period of several years, conferences have been held with men eminent in this field, and early in 1923 one hundred letters were sent out to physicians of achievement in radiology, requesting an opinion in regard to the formation of an American College of Radiology. To this questionnaire, approximately eighty affirmative replies were received, while dissent was expressed in only one or two instances. The American College of Radiology was accordingly organized in June, 1923, at the time of the meeting of the American Medical Association in San Francisco. A preamble, substantially as follows, was read to the group of interested men who participated in the meeting for organization:

It is proposed to organize an American College of Radiology, to be followed, if successful, by the formation of an American Association or American Congress of Radiology.

The primary thought in this movement was to work towards the amalgamation into one strong working unit of those groups of scientific medical men devoting their time mainly to radiology, most of whom are already members of the recognized societies. To initiate this movement properly, and to give sufficient time to work out a solution of this problem to the best interests of all concerned, it was proposed to organize, first, a college of radiology, selecting a working group of men whose years of successful experience entitle them to respect and the confidence of their colleagues. It is hoped this movement will co-ordinate—more closely than has been possible in the past—the efforts of different groups and thus lessen the burdens incident to attending a multiplicity of meetings and bring about a closer fellowship among those who stand for the most lofty ideals of humanity, as well as of scientific achievement in this highly specialized branch of medicine.

An organization of this kind should be able to exert a widespread influence in the following respects:

(1) Co-ordinating and unifying different groups of men already working in this

field in various associations, and also including in its membership isolated workers who would thus receive much help and stimulation;

(2) To encourage research in medical schools, private laboratories and, in certain restricted fields, by individual workers;

(3) To exchange new ideas as to methods and equipment;

(4) To stimulate the younger men in the profession to take up seriously this branch of medicine;

(5) To standardize equipment, therapeutic procedure, safeguarding of both patients and operators, the proper keeping of records and reports, so that sufficient uniformity may exist to make them comparable;

(6) To see that the proper opportunities are offered for the training of technicians and assistants; and finally, but by no means of the least importance,

(7) To guard and uphold the professional status of the radiologist himself by seeking from the medical profession at large such recognition as he has honestly earned, and by discrediting charlatans and ill-prepared operators or self-advertisers.

"The American College of Radiology" was duly incorporated under the laws of the State of California, the tenth day of January, 1924. The present membership is limited to one hundred, the members joining on invitation after favorable action by the Board of Chancellors. Some of the leaders of this group are also Fellows in the American College of Surgeons and in the American College of Physicians, and from the experience of these senior organizations, much may be learned.

The College is now functioning in an honest endeavor to be of service to medicine and surgery. Committees for the College are in touch with universities, hospitals, and medical colleges to assist in developing advanced standards for radiology. This includes minimum requirements for equipment and personnel in radiological departments, both private and public, proper courses for professional training in college or university, standards of measurements for radiation therapy, protective factors for operator and patient, and a general supervision over all matters into which the subject "Radiology" enters. There is every reason to believe that the aims and accomplishments of the institution will reflect credit upon American medicine in general and the science of radiology in particular.

For general information, some extracts from the constitution and by-laws are here given.

CONSTITUTION OF THE AMERICAN COLLEGE OF RADIOLOGY

Article I

Name

The name of this corporation shall be THE AMERICAN COLLEGE OF RADIOLOGY.

Article II

Object

The object of this organization is to create a fellowship among medical men who have distinguished themselves in the science of radiology.

Article III

Fellowship

Section 1: The fellowship of this organization shall consist of fellows and honorary members.

Section 2: Fellows shall be graduates of a reputable institution of medicine and surgery. They shall have devoted at least ten years of their life to the science of radiology, it being understood, however, that the Board of Chancellors may, by unanimous action, waive this in the case of an otherwise specially qualified candidate.

Section 3: Honorary fellows shall be those whose contributions to the science of radiology warrant honorary recognition.

Section 4: The fellowship shall be limited to one hundred (100).

BY-LAWS OF THE AMERICAN COLLEGE OF RADIOLOGY

Chapter I

Qualifications

Section 1: Fellowships in the American College of Radiology are created by action of the Board of Chancellors.

Section 2: Their election to fellowship shall be completed when they have presented to the College at an annual meeting an acceptable thesis.

Chapter II

Conduct of Fellows

Fellows whose conduct does not reflect the dignity of the organization may be reprimanded or expelled from the College at any time by the unanimous action of the Board of Chancellors.

Chapter III

Term of Office

Section 1: The President shall be elected to serve for two (2) years, his first year as President-elect and Speaker of the House of Chancellors, automatically becoming President of the College at the expiration of his first year.

Section 2: The Vice-president shall be elected to serve for one (1) year.

Section 3: The Executive Secretary shall be elected to serve for a term of five (5) years.

Section 4: The Treasurer shall be elected to serve for one (1) year.

Section 5: The Historian shall be elected to serve for one (1) year.

Section 6: Chancellors shall be elected to serve for a term of five (5) years; and two new chancellors shall be elected each year by the Fellows at the annual convocation.

Chapter IV

Location of Chancellors

Section 1: Chancellors shall be selected from the fellowship in such geographic locations as may best serve the functions of this Board.

Section 2: Chancellors are not eligible for the office of President or Vice-president.

Chapter V

Vacancies

Vacancies occurring among the officers of the College shall be filled by action of the Board of Chancellors.

THE TEACHING OF ROENTGENOLOGY IN THE UNIVERSITY OF MICHIGAN

By P. M. HICKEY, A.B., M.D., Professor of Roentgenology, University of Michigan

ONE of the advantages of the older methods of medical education was the early introduction of the student to the clinical side of medicine and surgery. The early contact with patients tended to be a constant stimulus to the student to pursue his studies with unflagging zeal. The development of the modern medical college has resulted in a rather sharp separation of pre-clinical and clinical subjects. This separation has been brought about by the necessity for the thorough instruction which is now given in the subjects of anatomy, physiology, bacteriology, etc. While it is unquestionably recognized that these preparatory subjects must come early in the student's curriculum, it is felt that the enthusiasm of the student would be better stimulated if there were a more intimate connection between the pre-clinical and the clinical subjects. One of the newer ways of promoting this liaison is by the introduction of roentgenology in the Freshman and Sophomore years. The use of the X-ray as an aid in teaching anatomy is serving to link the subject of anatomy with medicine and surgery. Accordingly, at the University of Michigan, through the cooperation of Dr. Carl Huber, *Professor of Anatomy*, the Department of Roentgenology gives a certain number of lectures and demonstrations in anatomy to the Freshmen students. These lectures are intended primarily, not to introduce the subject of roentgenology, but, rather, to make use of the X-ray as an adjuvant in the study of anatomy. The lectures illustrate the development of the skeleton during fetal life and during the growth of the child. Medical students, therefore, in their first year become familiar with the general subject of X-ray anatomy. These lectures are not confined alone to the osseous structures but take up the circulatory, respiratory and the digestive systems.

Didactic lectures on roentgenology were formerly given in the Senior Year but are now given in the Junior Year so that the medical student will, on entering upon his Senior work, have acquired an elementary knowledge of roentgenology and of film interpretation. The diagnostic lectures in the Junior Year are one hour a week throughout the entire year. Demonstrations are given of the simpler types of X-ray apparatus, and lantern slides are shown illustrating the uses of roentgenology in the various subjects of medicine. Special attention is paid to the correlation of X-ray examinations with other methods of examination. No quizzes are held during the year, but the students are furnished with a list of one hundred questions involving the more important phases of the lecture course and the final examination is based on a selection from these questions. In this way the student is given a definite idea of what is expected of him at the completion of the lecture course. By furnishing the student with a definite idea of what is expected of him, he is saved from spending an undue amount of study in preparation for the examination. Teachers of roentgenology should not be allowed to exact more than their proportionate amount of time.

The writer, some time ago in talking with Seniors who had completed their examination, found that many of them desired more specific instruction in roentgenology; accordingly, special elective courses are now offered during the Senior Year. These courses comprise demonstrations twice a week in film-reading and also a separate elective course in elementary roentgen technic. It is a matter of considerable gratification to those who are interested in the teaching of roentgenology to note the considerable percentage of Senior students who elect these optional courses, more especially the one in film interpretation. The student is encouraged to make his own deductions from the films presented and is assisted by suggestive questions

rather than by dogmatic demonstrations. An elective course in roentgentherapy is given which is not intended to qualify the student to do roentgentherapy, but, rather, to acquaint him with the broad clinical facts of X-ray therapy.

During the Senior Year students who are assigned clinical cases in medicine and surgery are encouraged in every way to make use of the X-ray Department in the study of their cases. Each Senior student is expected to be present at the fluoroscopic examination of gastric and pulmonary cases which have been assigned to him. As much care is taken in stressing the limitations of roentgen diagnosis as in the demonstration of the positive findings of X-ray study.

There is a very active co-operation between the Department of Physics and the Department of Roentgenology. In the second semester the Department of Physics gives a pre-medical course in physics, which teaches the fundamentals of X-ray physics. This course is given both by lectures and by practical laboratory work. The resident internes in roentgenology take this course as part of their hospital training. The Department of Physics also co-operates in teaching the electrical phases of roentgenology to post-graduate students.

FINANCING THE CLINICO-PATHOLOGICAL AND X-RAY LABORATORY IN THE HOSPITAL AND ALSO CONSERVING THE PROFESSIONAL AND ECONOMIC INTERESTS OF ITS MEDICAL PERSONNEL [1]

By BYRON C. DARLING, A.M., M.D., New York

IN regard to the economic status of the physician who is specializing in laboratory work, what applies to clinico-pathological laboratories applies also to the X-ray laboratory. Hospital laboratories and private laboratories should all be under the supervision of competent medical men, and sanitary codes, city and state, should be enacted accordingly, which should be duly recommended by county, state and national medical societies.

Laboratories in general must be put on a business basis so that there will be an adequate income to compensate the physician for his education, experience and ability. Why should not a good laboratory man be able to obtain as large an income as a good internist or a good surgeon?

In hospitals of a hundred beds or less, or over, the general proposition should be that all private or paying patients should pay a graduated fee to the laboratory. In the case of clinico-pathological work, the many smaller items can best be handled by making a flat laboratory fee of so much a month per patient, for what might be described as routine urine and blood work; special work, such as tissues, blood chemistry, blood cultures, etc., to be extra. When any one patient has obtained a certain maximum of routine examinations, all in excess should be made special with an extra charge. In most hospitals, the charity work would mean free bed patients,—all free bed patients to pay no laboratory fee; paying ward and semi-private patients to pay a graduated fee. This lump sum fee obviates the many bookkeeping items of separate charges, and if the patient and his physician understand there is a laboratory fee to be paid in every instance, it works with little friction.

In the X-ray department the examinations occur less frequently; the public is trained to appreciate the cost, and the separate fees can be collected along with the regular hospital bills, free patients free, and paying patients according to their ability to pay. The fees in all cases should be reasonable and based on the scale maintained in neighboring private laboratories of physicians of recognized ability. In this way the hospital laboratory physician is not his own competitor, nor does he compete unfairly with his colleagues for the private work.

The head of the laboratory should have such complete control of his department that it will make no great difference to him whether he does part of his private work or all of it in the hospital. The hospital should not be permitted in any way to control or intercept any part of his earning capacity any more than it does that of any other visiting physician or surgeon. The equipment should either be owned by the physician in charge, or, if the hospital owns the equipment, a strict accounting should be maintained, wherein the items of benefit that the physician receives from the hospital are offset by the amount of free work he does for the hospital. The laboratory and its medical officer in the hospital should be economically independent of the hospital itself. A man who has gone into a profession has not contemplated working for a salary. He is the type that is happiest in a certain atmosphere of independence. To be sure, he carries it too far if, as a professional man, he has not sufficient business sense to protect himself from the sharp dealers of the world, nor to get a just and due return for his services.

Where the hospital manages the laboratory, it has only the hospital point of view. Since hospitals are primarily charitable

[1] Read before the Radiological Society of North America, at Atlantic City, May, 1925.

institutions, they are always short of money and always behind in funds to make the necessary improvements to keep abreast of the times. The laboratory is seen as either a financial drag or as an opportunity for financial gain. Since this always has been done at the expense of the physician, each hospital in turn naturally expects to continue the precedent.

To put the laboratory physician in a sound economic position, he should have the opportunity, in running his department, to put enough business sense into its management that he may either gain a fair current profit or feel that he is building something for the future. Whatever the return may be, it is much more satisfactory to him than if he were to get the same amount of money on a salary basis.

A very interesting point has probably never been pressed, in that the hospital, being a charitable institution, incorporated in most states as such, claims freedom from taxation, but wherever it enters into directing business for gain, such as the laboratory business, or the conduct of industrial clinics, it is outside of its legal rights and threatens its freedom from taxation to this extent. And further, morally, from the very nature of the relation, the hospital authorities should be the ones to recognize a physician's deserts, and should be the last to attempt to exploit him.

To expect one class of physicians to understand the problem of another, and to fight fraternally for justice, is another ideal that has not yet been universally attained, for too many have the scars and the memory of their own struggles and no desire to take on any such altruistic battles. The individual, himself, whether eminent surgeon or beloved physician, has been cowed in his own time by the board of directors or the powers that be, and he is not going to risk his hard-won position in behalf of another who may all too soon be a possible competitor.

Among other things, physicians need to be protected from each other. No technician who ever started an independent laboratory did so without definite encouragement from some well-established physician or group of physicians or hospital, trying to obtain something cheaper than a professional level. The hospital superintendent would solve the problem by serving the laboratory work just as he does the meals, but the physician, who is a professional man, cannot be economically bound out to the front office as is a cook.

However, it must be remembered that physicians and surgeons were used in hospitals before the laboratory was started, and, in a way, hold the key positions, but it is only a question of time before the laboratory worker will be likewise received. Just as Bellevue and other hospital laboratories started at one time with one loaned microscope and now have large buildings devoted to laboratory work, so in time will the skilled, expert knowledge of the physician in charge of the clinico-pathological laboratory and the X-ray laboratory receive recognition and recompense, but not until long after he has fought, bled and died for his rights.

The internist and the surgeon are always able to refer patients to a hospital and fill the private beds, in this way bringing support and money to the hospital, not to speak of the donations they may encourage and the wills they may influence. The laboratory man apparently brings no income into the hospital. He is an additional expense. His work is not thoroughly appreciated by the board of directors, or his fellow physicians, or the public.

This situation is being slowly remedied by the timely and farsighted vision of the American College of Surgeons. In no other way could this or its many other self-imposed tasks have been accomplished. It argues well for medicine as a profession that the men who are recognized and respected as the highest type of medical men of the day are banded together to accomplish the ideals which they have established for themselves and for medical service in general. Their vision has been far and true; their execution has been marvelous;

much has been done for American medicine in a short time. A generation ago medicine in this country in its general reputation throughout the world was not in good favor. There was so much that was bad in medicine at large and in many of its best institutions that it is to the everlasting credit of the American College of Surgeons that our present position in the medical world is on such a high plane, and that our individual relations are becoming more professional, more sound economically and more scientific.

Now is high time for the clinico-pathological and X-ray laboratory medical man to find out what he wants and ask for it.

DISCUSSION

DR. I. S. TROSTLER (Chicago): As usual, when we hear from Byron Darling it is like a well aimed gatling gun; he shoots hard and hits the mark. I wish we might attain his ideal by ordinary methods, by the methods that business men use, but there is no question,—business methods won't work. They have been tried. We have to go after things as the lawyers do. We have to force them, either by one means or another; that is the law's way of doing things, by force, coercion. I personally want to thank Dr. Darling for presenting this subject. I think it is going to do some good.

DR. N. P. COLWELL, Secretary of Council on Medical Education and Hospitals, American Medical Association (Chicago): In his paper, Dr. Darling stated that the hospitals do not seem to get enough to pay their pathologists very well. The incomes from hospital laboratories vary considerably. I have been furnished figures from two hospitals in Chicago of equal size; in one of them at the end of the year the amount of the income over the expenditures was ten dollars and forty cents; in the other, the amount of income over expenditures was ten thousand dollars.

A MEMBER: Was that in the laboratories?

DR. COLWELL: Yes, that was on the laboratory work in the hospital. The expenses in the laboratory, of course, depend a great deal on the personnel. If there is an efficient and reliable personnel, the hospital has to pay them, and if it secures men of that sort it is fully justified in charging the patient accordingly. As to the rates charged: an investigation not long ago showed that over 60 per cent of the hospitals—at least of those that replied to the questionnaire—had a flat rate, and the flat was, on the average, about five dollars, except where special and more arduous methods had to be employed. In the methods that came under this flat rate, that is, if the patient was in the hospital seventy-two hours or more (I am quoting one instance of a hospital which renders good service of this sort), the flat rate covered gastric analyses, feces, smears, cultures, tissue examinations, and Wassermanns—*i.e.*, everything except blood chemistry, vaccines, basal metabolism, and spinal puncture analysis. For this hospital, of which the capacity was one hundred and thirty beds, I have the figures for two months' expenditures and income. In the first month the income was $1,466 and the expenditures $911. In the second month the income was $1,591 and the expenditures $927. For the two months the total income was $3,057 and the expenditures $1,838, leaving a profit for the two months of $1,219. Deducting the expenses for light and heat, the profit for the two months was $665.

Dr. Darling spoke about the work of organized medicine in bettering medical practice. We all know of the tremendous work done by the American College of Surgeons in this field. I believe the Doctor is familiar also with the work which has been carried on by the American Medical Association since 1900 in the bettering of conditions in medical schools and the clearing up of quackery in the field of medicine.

As you know, we had, in 1904, 162, or over half of the world's supply, of medical schools in the United States. As compared with the educational standards abroad, only two of the 162 schools came up to or passed the standard abroad, and of this total, scarcely thirty required even a high school education for admission. We had more than half the world's supply, but we had very few which met the standards of the European colleges. It was easy to see what object we should work for, namely, fewer but better medical schools.

Since 1904, there has been a reduction to just half that quantity—eighty medical colleges instead of one hundred and sixty. This was brought about largely, as some of our friends from Louisville know, by the merger of from two to five schools of a mediocre nature into one good one—and let me say that Louisville now has a very good one, too. In Chicago there were fourteen colleges and eight of them were graded in Class C, only one of which still exists. We have four in Class A. While there was a reduction from a hundred and sixty-two to eighty, there are seventy rated in Class A and they have remained there along with a constantly increasing standard of measurement. Our first standard of measurement, in 1907, was necessarily low, and the main thing was to find out whether a college was in the place it was said to be located and whether it was doing honest work, regardless of how inferior it may have been from a financial standpoint. Meanwhile, some of these colleges, struggling along as they were, turned out some mighty good physicians.

In the seventy colleges, along with the increase in entrance requirements, we have, of course, more and better buildings, more and better laboratories, a higher class of teachers, and more finances. It now costs three times as much as a student pays in fees to give him a medical education. The extensive improvements in medical education represent just one of the marvellous changes in social conditions that we have experienced during the last two or three decades. We have also "the movies," the airplanes, the radio, and better roads, all of which have greatly changed the social conditions of both country and city people, and have brought newer problems to deal with.

Coming back to the hospitals, something was said about the establishing of a flat rate for laboratory work. The flat rate has one good effect in that many of our physicians who were not educated under modern standards do not fully appreciate the value of laboratory analyses. Under the flat rate, their patients get the benefits of these analyses as a matter of routine, and the physicians find out what and how important the modern laboratory methods are.

The pay of pathologists varies considerably. It is usually by the straight salary method, but in hospitals in which well-to-do classes of patients are handled, a good salary is sometimes paid to start with, and, in addition, 50 per cent of the net amount received from laboratory fees. In that way some of the pathologists are getting fairly good incomes. I cannot quote figures yet because we have not gone far enough in our investigation to do that. In the average hospital, the patients certainly ought to pay not only the charges of conducting a good laboratory department, but also enough to pay for good personnel in that laboratory.

DR. DARLING (closing): I have nothing further to say except to make a sort of apology for the title,—it is not so much financing the laboratory; the title is a psychological endeavor to attract the hospital authorities and, after all, what they have been doing is getting their financing out of the medical personnel largely, and I think that the title will have to stand as it is.

THE "RADIOGRAMETER"

A SCALE FOR MENSURATION BY MEANS OF THE ROENTGEN RAY [1]

By CLAYTON R. JOHNSON, M.D., Los Angeles, California

IN 1921, Chamberlain and Newell[2] reviewed the literature and offered a method based on mathematical calculations for determining the various diameters of the maternal pelvis by means of the roentgen ray. In their hands the method has met with considerable success, but, apparently, because of its difficulty of operation, it has not become widely applied. What I wish to offer, is a method similar in some respects and yet one which is devoid of all mathematical calculations. This method is not only applicable to the problem of pelvimetry, but to all those conditions in which mensuration between various points shown on the radiograph would be an aid to diagnosis.

SPECIAL APPARATUS REQUIRED

The scale, or "Radiogrameter," as I have called it, takes the form of a truncated right angle triangle. It is preferably engraved upon a metal plate, so that it may be both durable and maintain its accuracy. It consists of a series of lines parallel to the base of the truncated right angle triangle, and a series of meridian lines crossing them. The parallel lines are numbered from 0.5 to 50, and are drawn at intervals from the base line, such intervals having been determined mathematically. When radiographs are taken according to the method which will be described, each line on the scale represents the actual height, above the base of the scale, of a plane passing through a point having a shift in its shadow when measured in millimeters, corresponding to the numbers along the altitude of the scale. For example, a point having a shift in its shadow of 10 mm. will fall somewhere on the line marked 10, and its actual altitude with relation to its shadow on the radiograph will be the altitude of the parallel line marked 10 with relation to the base line of the scale. The meridian lines radiate from a point on the projected altitude of the scale 635 mm. above the base line of the scale, and fall at intervals of 5 mm. along the base line of the scale.

The remaining necessary apparatus consists of a lead plumb bob, square in cross-section, a 1 mm. aluminum filter from the center of which the plumb bob is suspended by means of a cord, an accurate 20 cm. architect's rule, ruled in ½ mm.; a pair of fine point dividers, and a 10 cm. metal bar.

In demonstrating the method of making the radiographs and the calculation of distances between various points shown on the radiographs, the following experiment was devised: A five-pound barium sulphate box, with screws and nails of various shapes and sizes driven through its sides at various altitudes, was taken for the subject to be examined. It was very desirable, because the points for consideration could be easily identified on the films, the distances between them calculated, and then the calculated distances compared with the actual ones. In repeated experiments there was at no time a variation of more than 1 mm. between the calculated and the actual distances as measured between the points on the box. The accompanying illustrations are actual photographs of the experiment, showing the various steps from the making of the radiographs to the final calculation of the various distances. By referring to these illustrations, with relation to the accompanying description, the method of operation should be readily understood.

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[1] Read before the Radiological Section of the Los Angeles County Medical Society, October 21, 1925.

[2] Chamberlain, W. Edward, and Newell, R. R.: Pelvimetry by Means of the Roentgen Ray. Am. Jour. Roentgenol. and Rad. Ther., May, 1921, p. 272.

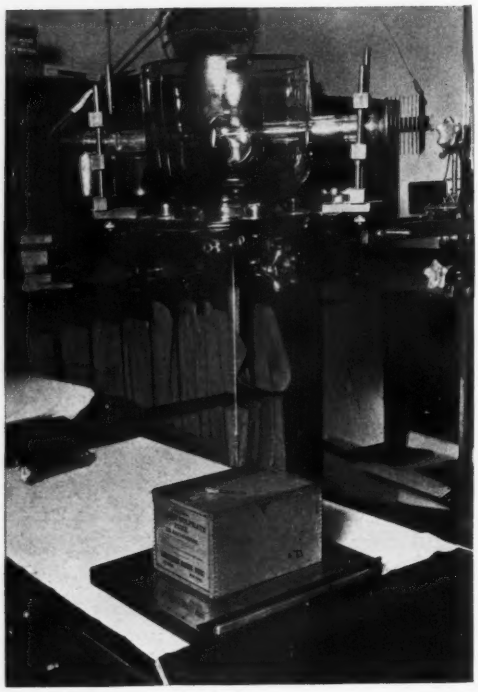

Fig. A.

TECHNIC FOR MAKING THE RADIOGRAPHS

(FIG. A)

1. Place the 1 mm. aluminum filter in position beneath the tube and from its center, through a pin hole, suspend the plumb bob by means of a cord.

2. Center the tube in the lead glass bowl so that its focal spot is in direct line with the cord supporting the plumb bob.

3. Adjust the focal spot film distance to exactly 635 mm., or 25 inches.

4. Place the 10 cm. metal bar in some position on the subject to be radiographed so that its shadow will be cast upon the film.

5. Make stereoscopic radiographs, using a shift of exactly 63 mm., or 2½ inches, being very careful to have the films in the same position for each of the two exposures.

The focal spot film distance of 635 mm. has been chosen because it represents an average standard for all radiographic work, and it is that distance commonly used with the Bucky diaphragm.

The 10 cm. metal bar is used as a check on the accuracy of the technic. The length of the bar may be calculated from its shadow on the radiographs, and if this agrees with its actual length, the technic must have been correct. If the calculated length of the bar is not 10 cm., the most frequent source of error will be found in the failure in centering the focal spot of tube in direct line with the cord supporting the plumb bob. The only other possible sources will be in the shift, the focal spot film distance, or movement of the patient between exposures.

THE CALCULATION FROM THE RADIOGRAPHS

The method of calculation will be given in steps, and with each step in the process, reference will be made to an accompanying illustration.

1. (Fig. 1.) Mark the center of the plumb bob shadow and the points from which the measurements are to be made with ink dots on one of the radiographs. Transpose the radiographs so that the shadows on the unmarked radiograph exactly overlie corresponding shadows on the one previously marked, and make ink dots on corresponding points. The films will have to be shifted as each of the corresponding shadows are transposed. Also, it will be noted that shadows which are somewhat indistinct on the single radiograph will become quite clearly outlined.

2. (Fig. 2.) Transpose the radiographs with their edges parallel so that the centers of the plumb bob shadows are exactly 63 mm. apart, and fasten the two films together with paper clips. With the rule, measure in millimeters the distance between the shadows of all the various points under consideration and note them on one of the films. This will be known as the shift in the shadow of the point.

3. (Fig. 3.) On the same radiograph, having now separated the two films, draw

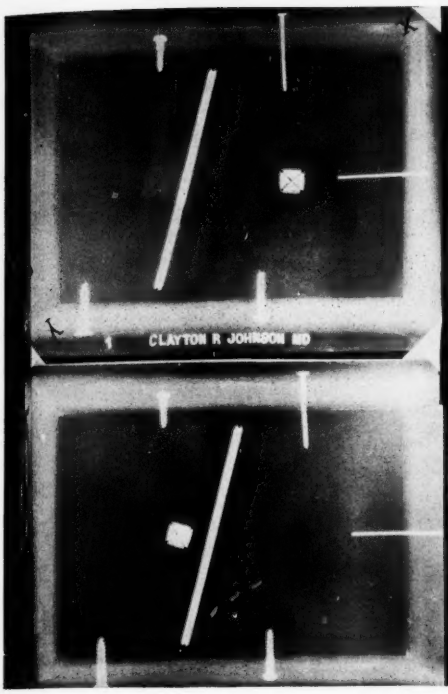

Fig. 1.

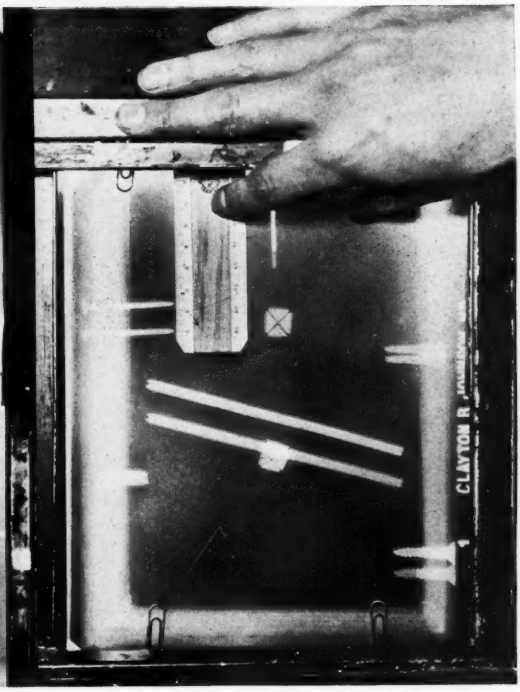

Fig. 2.

lines from the center of the plumb bob shadow to the points. Considering one point at a time, measure with the dividers the distance on the radiograph from the center of the plumb bob shadow to the shadow of the point.

4. (Fig. 4.) Lay off this distance on the base line of the radiogrameter, measuring outward from the altitude of the scale, and lay a rule on the course of the meridian line arising at the tip of the right leg of the dividers. When this point does not fall on one of the meridian lines marked on the scale, the course of a meridian line arising from such a point may be approximated.

5. (Fig. 5.) Take the shift of the shadow of the point as previously determined in Step 3 and marked on the film, and find the parallel line on the scale having the same number. With the dividers, measure the distance on this parallel line, measuring outward from the altitude of the scale to the point at which it crosses the meridian line outlined by the rule.

6. (Fig. 6.) Mark this distance on the film, measuring outward from the center of the plumb bob shadow on the line connecting the plumb bob shadow with the shadow of the point in question. This will be the actual distance of the vertical projection of the point in question from the line of the vertical ray. Repeat the same procedure with all the other points in question, thus determining the vertical projection of all these points upon the film.

7. (Fig. 7.) With the dividers, determine the distance between the vertical projections of two points under consideration.

8. (Fig. 8.) Lay off this distance on the parallel line of the scale corresponding to the point having the least shift in its shadow, measuring outward from the altitude. With the rule, measure the distance from the right point of the dividers to the number on

the altitude of the scale corresponding to the shift of the shadow of the other point. This distance will be the actual distance between the two points whose shadows are shown on the radiograph.

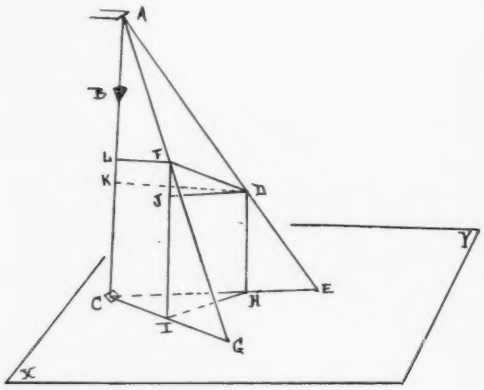

Fig. B.

It is well to first calculate the length of the metal bar from its shadow. If this checks with its actual length, it may be assumed that all the calculations will be correct.

EXPLANATION OF THE METHOD BY DIAGRAM

For those who may be interested in the theoretical consideration of the method, the following description is given, which is to be followed in connection with Figure B, Figure A, and Figure 1.

Given, XY, one of a pair of stereoscopic radiographs upon which are the shadows E of the point D, G of the point F, and C, the shadow of the plumb bob B cast by rays from the target A.

The problem, to determine the actual distance between points D and F.

Lines are drawn on the radiograph connecting C and G, and C and E. The distance CG is measured on the radiograph and laid off on the base line of the radiogrameter. The altitude of point F above the plane XY is equivalent to the point L, and is determined by the shift of the shadows of the point F when the stereoscopic films are transposed. Where the meridian line arising from the point G crosses the parallel line arising from point L, when plotted upon the scale, will be the actual location in space of the point F, with relation to the plane XY. Therefore FL rep-

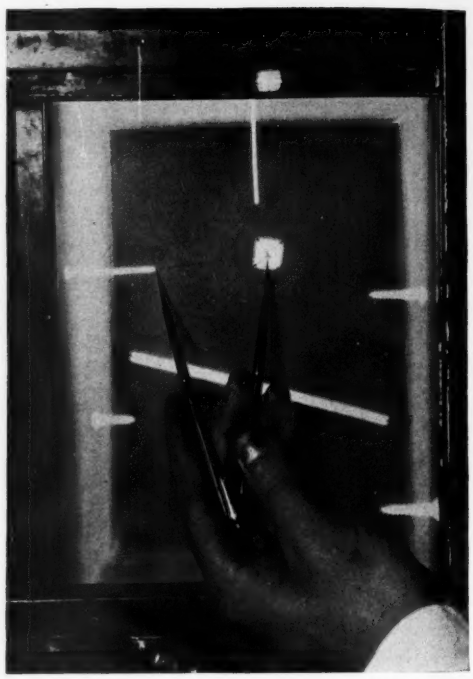

Fig. 3.

resents the horizontal distance of the point F from the line of projection of the vertical ray AC, and when laid off on the line GC and represented by the point I, marks the vertical projection of the point F on the radiograph XY.

Likewise, H marks the vertical projection of the point D on the radiograph.

HI, the distance between the vertical projections of the points D and F, may then be directly measured upon the radiograph.

The distance DF is then the hypotenuse of a right angle triangle, whose base is equivalent to HI, and whose altitude FJ is equivalent to KL, the difference between the altitudes of the points. This triangle is

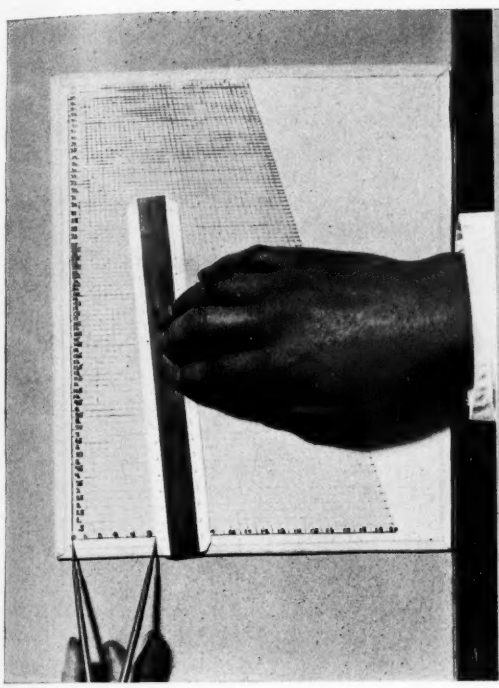

Fig. 4.

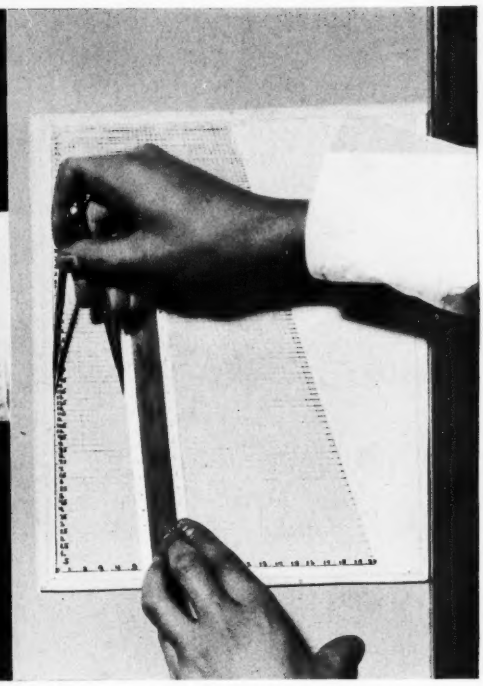

Fig. 5.

then plotted upon the radiogrameter, and the distance DF measured directly.

PRACTICAL APPLICATION OF THE METHOD

In the practical application of the method, the first problem presenting itself was that of pelvimetry, which, I believe, is the most difficult of all. In order to get well oriented as to anatomical points shown on the radiograph from which various measurements were to be made, a dry pelvis was placed in the position on the table similar to that of the pelvis of an imaginary patient. Stereoscopic radiographs were made according to the technic outlined. The various diameters of the pelvis were calculated and compared with the diameters as measured directly on the pelvis by another observer. In no instance was there a variation of more than 1 mm. between the calculated and the actual diameters. These results were so encouraging that the method was put into actual practice, with results as noted in the following illustrative cases.

Case 1. Female, age 25, at term, with history of previous difficult labor. A cesarean section had already been decided upon, regardless of the radiographic findings. Diameters of the pelvis were calculated and were found to compare quite favorably with those of the normal, with the exception of perhaps a half-centimeter shortening of the conjugata vera. The diameters of the sagittal plane of the fetal head were also calculated, which also seemed quite normal. Two days after the examination, the baby was delivered by cesarean section and the unmoulded head measured by the interne in charge at the hospital. As compared with the calculated diameters, there was a variation of 2 mm. in the sub-occipito-bregmatic diameter, and a variation of 1 mm. in the fronto-occipital diameter.

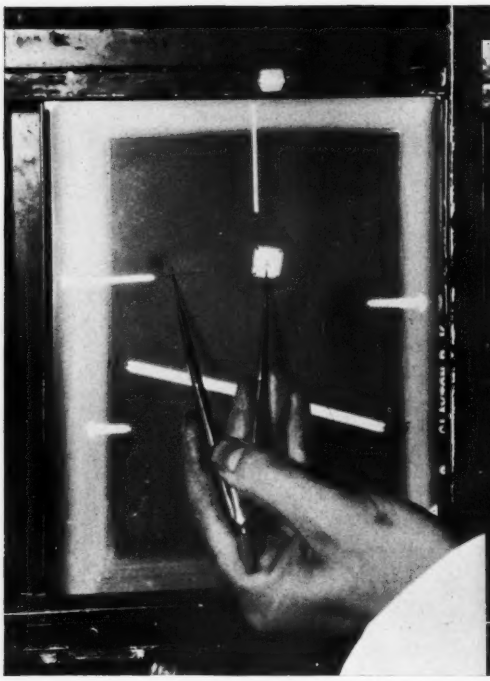

Fig. 6.

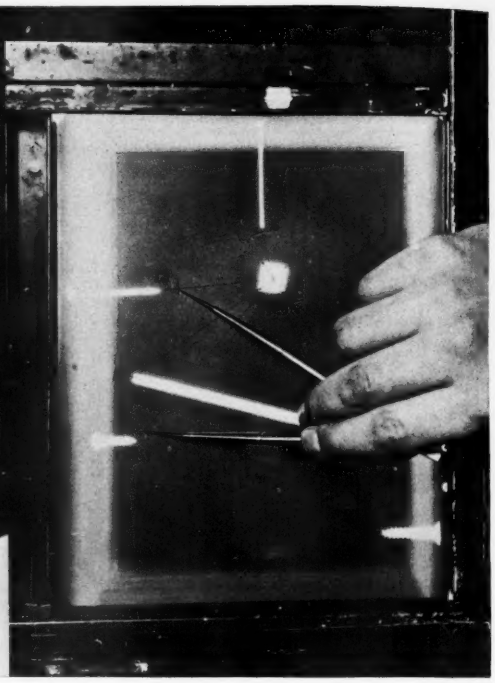

Fig. 7.

Case 2. Male, age 40, with post-operative appendiceal sinus. The surgeon in charge could pass a catheter into the sinus for approximately 15 cms., but he had no idea as to its depth or course. Two lead markers were placed upon the skin surface and the sinus injected with bismuth paste. The problem then became one of localization of a foreign body, with relation to the skin markers. The vertical projections of various points in the sinus were first determined on the radiograph. These points then outlined the direction of the sinus with relation to its opening on the skin surface. By noting the shift of the shadows of the various points, their altitude, with relation to the skin surface, was easily obtained. With these data, diagrams were constructed to actual size, illustrating the extent and depth of the sinus. By the aid of these diagrams, the surgeon was able to dissect the sinus with comparative ease, which resulted in an uneventful recovery.

Case 3. Male, age 30, with clinical diagnosis of floating kidney, accompanied by Dietl's crisis. Radiographic examination revealed an oval-shaped shadow superimposed over the hilus of the right kidney. As localized, this shadow was found to have been produced by an object 12 mm. in diameter in its long axis and lying in the same plane as the lower pole of the kidney. A diagnosis of stone in the pelvis of the right ureter was made, which checked well with the clinical findings.

Case 4. Female, age 45, with vague gastro-intestinal symptoms. In the routine examination, radiographs of the gall-bladder region were made and shadows similar to those produced by gallstones were noted. As localized, these shadows corresponded to those produced by opaque objects 10 cms. anterior to the tip of the transverse process of the second lumbar vertebra and just posterior to the plane of the costo-cartilaginous

junction of the ninth rib. Because of their localization and their general appearance, a diagnosis of gallstones was made, which diagnosis was later confirmed at operation.

The above cases illustrate to some extent the practical application of mensuration between points shown on the radiograph.

The apparatus and method have been used for a comparatively short time by Dr. R. A. Carter, at the Los Angeles General Hospital, with favorable results under some most trying conditions. I wish to thank Dr. Carter and his staff for their co-operation in its perfection and practical application.

CONCLUSIONS

1. What I believe to be new is the scale, or "Radiogrameter," and the method of calculation.
2. The method is accurate and may be easily applied by the average radiologist.
3. The range of practical application is unlimited.

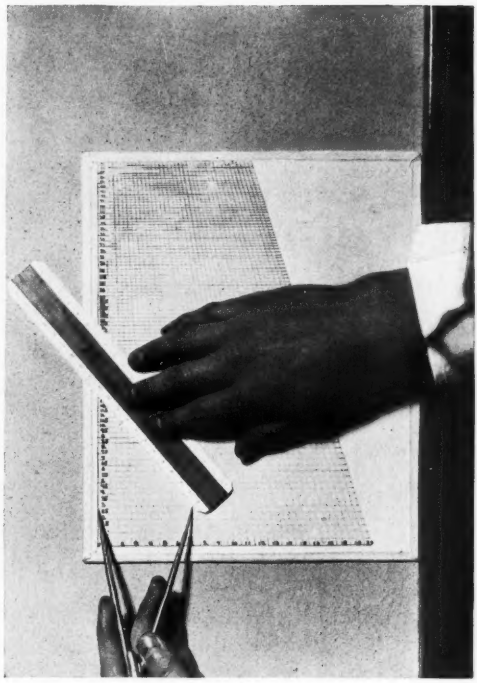

Fig. 8.

ROENTGEN DIAGNOSIS OF SYPHILIS OF THE STOMACH [1]

By LEON T. LEWALD, M.D., Professor of Roentgenology, New York University and Bellevue Hospital Medical College, NEW YORK CITY

IN view of the renewed interest in the subject of gastric lues, owing to a recent critical review of reported cases from the pathological and clinical viewpoints (1), it seems advisable to emphasize the *roentgen-ray diagnosis* of this condition, inasmuch as other findings are not always conclusive. This is particularly the case in regard to the histological findings. Turnbull (2) states that the histological diagnosis of syphilitic inflammation is even more difficult in the case of the stomach than in that of other organs (Fig. 3B). The demonstration of spirochetes in gastric lues has been made by Dr. McNee (3), and previously by Dr. Warthin,[2] but in many other cases of undoubted gastric syphilis spirochetes were not demonstrable.

Inasmuch as the X-ray findings are so clear-cut and distinctive in certain other pathological conditions that they are accepted without histological confirmation—for example, in the diagnosis of bone tumor, where it is now generally conceded that the roentgen-ray findings are sufficiently definite to render biopsy unnecessary in deciding when to operate or give X-ray treatment[3]—it is believed that the same criterion is applicable to the diagnosis of syphilis of the stomach. This is true, particularly when an improvement in the X-ray appearance of a stomach lesion is obtained after antisyphilitic treatment has been carried out (Fig. 1).

Chiari's statement *in 1891* that histological evidence was necessary in the diagnosis of syphilis of the stomach (4) loses great weight in view of the fact that *this statement was made before the discovery of the X-ray by Roentgen in 1895.* To insist on Chiari's criterion in the diagnosis of gastric syphilis seems to me to mark a backward step in the diagnosis and treatment of syphilis of the stomach. It appears necessary, therefore, to emphasize the fact that the roentgen diagnosis of syphilis of the stomach, when based upon proper interpretation of the evidence afforded by roentgenological data, especially repeated examination after antisyphilitic treatment has been instituted, is reliable and should never be ignored.

McNee recites the tragic circumstances leading to the death of a patient from failure to recognize a syphilitic lesion in the stomach (3). The condition was erroneously diagnosed clinically as inoperable cancer of the stomach, and even after a diagnosis of perforation was made, the patient was not given the benefit of surgical relief. Autopsy revealed a very extensive ulcerative lesion of the stomach (Fig. 2), reaching almost from the cardiac orifice to the pylorus. The finding is of great importance, for it is often erroneously stated that a given lesion of the stomach must be due to carcinoma *because of its extent.*

An abstract of McNee's report of the case follows:

The patient, male, a clerk, aged 57 years, had lost fifty-six pounds in weight during a period of six months. There was considerable pain and tenderness in the left epigastrium, and a tumor could be felt in this region, protruding below the left costal margin. The mass was about the size of a hen's egg, hard, of irregular contour, and moved with respiration. A diagnosis of malignant growth was made. The gastric contents were examined on two occasions, and on both of these free hydrochloric acid was absent. About a month after admission a fairly copious hematemesis (12 oz.) took place, followed by a second very large hemorrhage about a fort-

[1] Read before the Mid-annual Meeting of the Radiological Society of North America, Atlantic City, May 22-23, 1925.

[2] WILE, U. G.: Visceral Syphilis. Archives of Dermatology and Syphilology, May, 1920, N. S. Vol. 1, p. 551. "A recent case at the University Hospital in Cabot's service gave a negative Wassermann in the presence of typical syphilitic ulcer. Spirochetes were demonstrated by Warthin in the excised material."

[3] BLOODGOOD, J. C.: In a discussion (Oct. 27, 1925) of the diagnosis of a bone tumor at the Hospital for Joint Diseases, New York, he stated that the microscopical examination showed spindle cells with dividing nuclei, "but to me the X-ray was more convincing."

HERENDEEN, R. E.: Diagnosis of Bone Tumors. Radiological Society, Dec. 10, 1925.

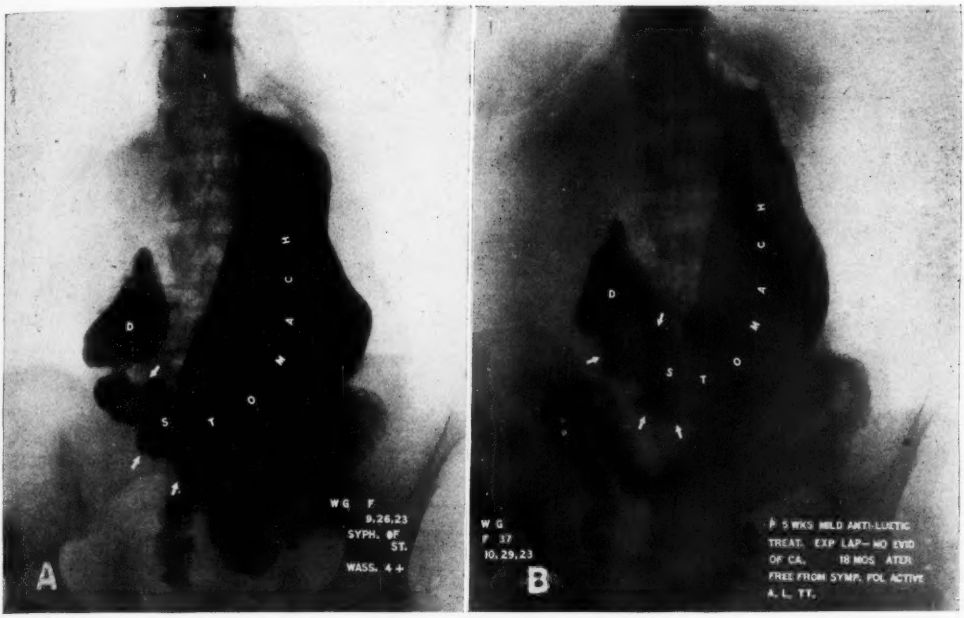

Fig. 1. Case 1. Syphilis of stomach. (*A*) Before treatment. (*B*) After treatment. Diagnosis confirmed by operation and subsequent history.

night later. Signs of probable perforation of the stomach were also recognized, but in view of the diagnosis of carcinoma which had been made, an operation was not considered advisable. Since there appeared so little doubt of the diagnosis of malignant growth, the Wassermann reaction was not carried out.

At the autopsy generalized peritonitis was found, resulting from perforation of the stomach. Apart from the stomach no other organs showed noteworthy pathological changes, and nothing was found suggesting the presence of an antecedent syphilitic infection. The liver was normal in size and free from disease.

On opening the stomach a remarkable condition was found, which at first sight (Fig. 2A) appeared to fit in with a diagnosis of gastric carcinoma of scirrhous type. On examining the organ more closely, however, it was seen that the characters of the ulceration were peculiar, while further dissection showed the lymphatic glands draining the gastric area to be small and free from all signs of cancerous invasion. The absence of secondary growth in the liver in the presence of such extensive ulceration also excited notice.

The lesser curvature of the stomach, from a point about one inch below the cardiac end to the pylorus, was completely ulcerated. Only about two-fifths of the stomach wall was free from ulceration.

In section, the thickened wall had everywhere a dense pearly white appearance, such as is often seen characteristically in scirrhous carcinoma of the organ. No giant cells were seen in any of the sections examined. The early stage of the lesion consisted of large and dense collections of small round cells encircling the blood vessels, with, in a few places, the development of small patches of granulation tissue (Fig. 2B). In sections from *one* block only, spirochetes were discovered in great numbers penetrating deeply in the actively growing granulomatous tissue (Fig. 2C).

Among McNee's conclusions are the following statements:

Cases of this kind resemble so closely carcinoma of the stomach that an erroneous diagnosis, in the absence of other overt signs or a history of syphilis, is very likely to be made. The resemblances to carcinoma include: (*a*) The invariable presence of a palpable tumor in the epigastrium; (*b*) The occurrence of loss of weight and cachexia; (*c*) The absence of free hydrochloric acid in the gastric juice. Hematemesis may occur from necrosis of part of the gummatous mass, before endarteritis and thrombosis of the arteries have occurred. The pathological lesion consists of a granulation tissue mass, or gumma, in the submucous layer of the

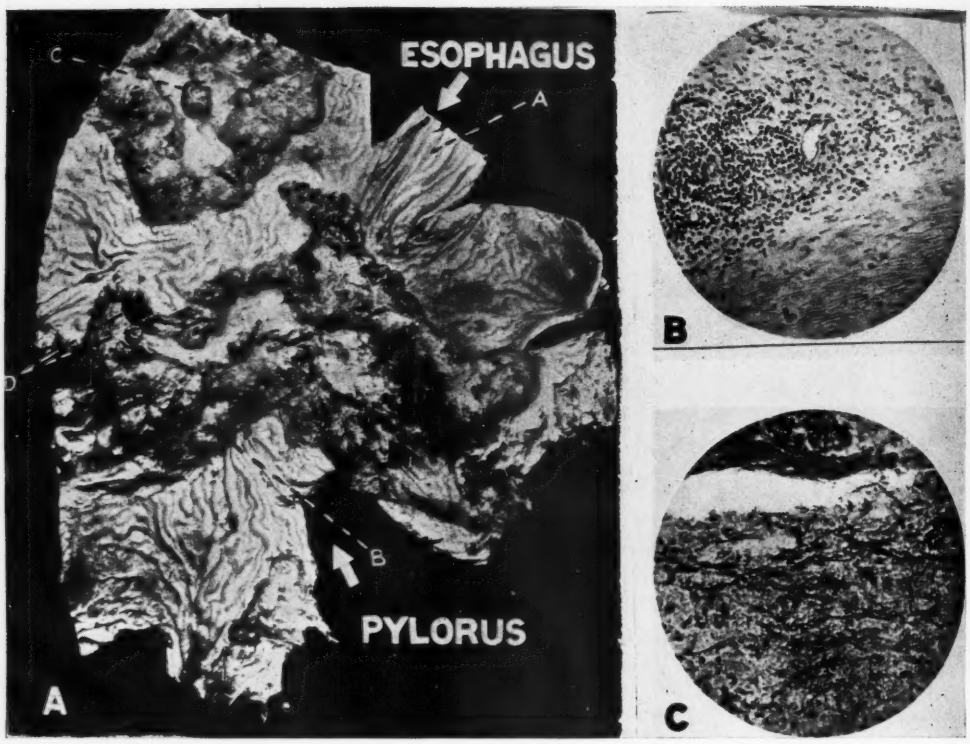

Fig. 2. Syphilis of stomach, McNee's case. (*A*) Note extent of involvement extending from pylorus to cardia. (*B*) Section showing round cell infiltration. (*C*) Section showing spirochetes.

stomach, which soon leads to destruction of the overlying mucosa and to ulceration.

Regarding the difficulty in diagnosing gastric syphilis, the following remarks by Wile are of interest (5):

In considering the pathology and clinical features of gastric syphilis, one is impressed by the great difficulty in diagnosis, owing to the fact that there is nothing specific in any case that points to syphilis rather than to any other form of gastropathy. Any one of the reported cases, so far as the clinical picture is concerned, could easily pass as a classical type of one or other of the forms of gastric disease. In all cases of gastric disease, therefore, the greatest importance attaches to the possibility of syphilis, particularly in cases in which there may be some deviation from the type as classically described. A patient who has gastric disease will be benefited by a careful anamnesis as to a pre-existing syphilis, and a careful examination as to other symptoms of syphilis in other parts of the body. Due reservation must be made, however, for the possible association of syphilis and cancer. It is not at all unlikely that many carcinomas of the stomach may find their points of origin in scars of recent syphilitic ulcers. Such degenerations occur in syphilitic lesions in the rectum and on the skin, and it is highly probable that they occur in the stomach as well. In any event, in doubtful cases, the therapeutic test remains as the best aid to diagnosis. A case of gastric disease which resists all other forms of medication and clears up promptly on the intelligent administration of antisyphilitics is rather more than circumstantial evidence as to the syphilitic nature of the process.[4]

The roentgen findings of syphilis of the stomach may be divided as previously reported (6, 7, 8):

(1) Diminished size, accompanied by almost immediate evacuation of most of the

[4] Wile and Smithies lay particular stress on the cases in which there is diffuse infiltration of the stomach giving rise to distortion and contraction associated with rapid emptying (Fig. 6).

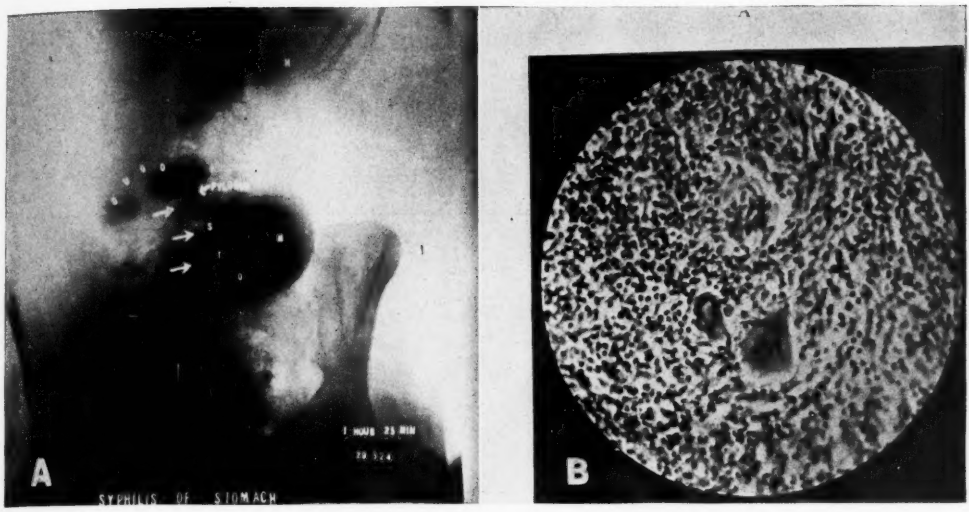

Fig. 3. Syphilis of stomach. (*A*) Before treatment. (*B*) Section removed at time of gastroenterostomy.

stomach contents. There is often *compensatory dilatation of the esophagus* in this type of case (Fig. 6).

(2) Deformity of the stomach of fairly symmetrical nature, involving a large portion of the middle of the body of the organ, producing a *dumbbell-like appearance* (Fig. 7). When this appearance is found in a young individual, or in an older individual without the characteristic appearance of cachexia, commensurate with a malignant involvement of the stomach of the extent indicated by the roentgen findings, syphilis of the stomach should always be suspected, and if a positive Wassermann reaction is obtained, the diagnosis is established with reasonable certainty.

(3) In cases showing a remarkably small *tubular* stomach, commonly spoken of as linitis plastica, or "leather-bottle" stomach, the problem is more difficult, as this condition even in young individuals may denote carcinoma of the stomach. In other instances the condition may be one of fibromatosis. In other cases it may be due to syphilis (Fig. 8).

(4) In another class of cases the roentgen appearances are very similar to those found in carcinoma of the stomach and consist of localized areas of infiltration of the stomach wall (Fig. 1), but the lesion may be as extensive in syphilis as in carcinoma.

(5) The lesion may be situated at the pylorus and produce marked stenosis and gastric retention. In this respect the condition resembles that observed in ulcer, or carcinoma of the stomach, but it is always more extensive than the lesion in simple ulcer (Fig. 3).

Carman gives the following roentgenological signs of gastric lues (9):

(1) Filling defect of the gastric outline, usually without corresponding palpable mass.
(2) Hour-glass stomach (dumbbell), or the upper loculus may be expanded and bulbous, and the lower loculus may be tubular, due to extensive irregular concentric contractions.
(3) Six-hour retention less frequent than in other gastric lesions (about 20 per cent).
(4) Diminution of gastric capacity.
(5) Stiffening or lessened pliability of the gastric wall.
(6) Absence of peristalsis from the involved area.
(7) Pylorus free rather than obstructed.
(8) Patient usually under cancer age, and not ill in proportion to the extent of the disease shown by the X-ray.
(9) Absence of a niche, accessory pocket, or typical incisura—classic signs of simple gastric ulcer—were notable in all cases, the only exception being that recorded by Portis.

Fig. 4. Case 2. Male, aged 63. Extensive lesion of stomach. Gastroscopic examination by Dr. Chevalier Jackson, who stated that there was no evidence of malignancy and suggested the possibility of a mixed lesion. This might be a case of lues similar to McNee's case, or carcinoma combined with lues.

Fig. 5. From case reported by Hartwell as simple ulcer of pars media and pylorica in a patient having a four plus Wassermann. Arrows inserted to indicate extent of lesion for comparison with Case 1, *A* and *B*. Extensive resection performed.

Tuberculosis of the stomach is extremely rare, and in the few cases reported the pyloric end has been the portion involved. This may be confused with syphilis of the stomach on histological examination, owing particularly to the presence of giant cells and other changes resembling those found in lues. Demonstration of the presence of tubercle bacilli should be insisted upon in confirming the diagnosis of tuberculosis of the stomach. Broders reported a case in detail (10).

CASE REPORTS

Case 1. W. G., female, aged 37, referred by Dr. Evan J. Smith. History of loss of twenty pounds' weight in four months. An indefinite small mass could be palpated in the epigastric region. Pain in stomach about two hours after meals relieved by taking bicarbonate of soda. Had similar trouble three years previously.

Roentgen examination shows deformity of the stomach involving the greater curvature and extending from the pars media to within a short distance of the pylorus (Fig. 1A). In view of the age of the patient a Wassermann examination was requested and was reported positive. The patient was then placed on antisyphilitic treatment and another radiographic examination was made five weeks later which showed slight improvement in the appearance of the stomach (Fig. 1B). However, in view of the possibility of newgrowth, surgical exploration was undertaken. This showed a definite, sharply defined lesion without involvement of the neighboring lymph nodes. It was thereupon decided that the lesion was due to syphilis of the stomach and no further operative procedure was undertaken. The patient was placed under more active antisyphilitic treatment which included twelve doses of neosalvarsan, and mercury and iodides. Ten months later the patient had completely regained her health and weight, and stated she had never felt better in her life. She was pregnant five months, so X-ray examination was not undertaken, but it is expected that this will be done at a later date.

Comment: The extent of the lesion and situation of the deformity on the greater

curvature would exclude a diagnosis of simple ulcer. The improvement under antisyphilitic treatment in five weeks tended to exclude newgrowth, but in order to confirm these findings exploratory laparotomy was undertaken. The positive Wassermann reaction and the sharp limitation of the edges of the lesion led to a negative finding of newgrowth, so that an extensive resection of the stomach was avoided and time has proved the wisdom of this procedure.

Hartwell reports a similar case (1) of a woman, aged 39, presenting a four plus Wassermann, a marked deformity of the stomach being demonstrated by X-ray, of the abrupt infiltrating type (Fig. 5). There was no free hydrochloric acid in the stomach contents, with a history of intractable vomiting and gastric pain extending over a period of five months. During this time she had lost forty pounds in weight and was correspondingly weak, but she was not anemic nor cachectic. An extensive pyloric resection seemed advisable, and this was done, followed by a Polya-Reichel repair. Microscopic examination of the stomach lesion made by Symmers showed the presence of a "simple ulcer without evidences of tuberculosis, syphilis, or malignant transformation." Hartwell states that after the resection of the stomach the patient was given antisyphilitic treatment. I would venture to state that, had treatment been instituted at once, resection of the stomach might have been avoided, as in Case 1.

Case 2. A. A., male, aged 63, referred to me by Dr. R. A. Herendeen. There was a positive history of a primary specific lesion forty-two years before. Roentgen examination (Fig. 4) showed an extensive involvement of the stomach, but there was a negative Wassermann reaction. *Gastroscopy* was performed by Dr. Chevalier Jackson on two occasions, with the following reports:

First examination: "The upper border of the lesion in the stomach has not the characteristic fungations of cancer as seen endoscopically; but until we have explored the lower border of the growth we would not be prepared to make a diagnosis. The lower border of the lesion may be malignant, but the upper border, as seen, is of inflammatory character, possibly secondary

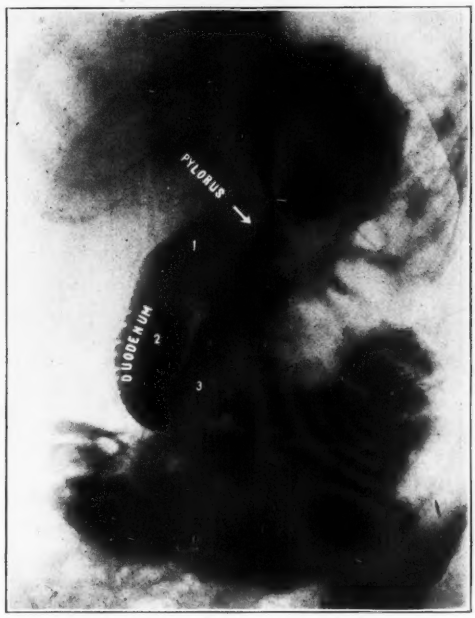

Fig. 6. M. A., female, aged 23. Syphilis of stomach, Type 1. Note the exceedingly small size of the stomach and the very rapid emptying. There is also compensatory dilatation of the esophagus.

to another kind of process." Dr. B. C. Crawford reports that "Sections from the fragments of tissue reveal an inflamed and thickened stomach mucosa. The gland structure is hypertrophied but the acini are regular as to their formation and relation to the surrounding tissue. The submucous tissue is the seat of extensive diffuse mononuclear leukocytic infiltration and fibrosis. Portions of the muscular coat are included in some of the fragments. *No evidence of malignancy is observed* in any of the sections. Serial sections were cut from the fragments of tissue and a hundred and four were examined from various levels."

Second examination, three days later: "Gastroscopy reveals the same conditions noted at previous examination. *My belief*

is that this lesion is luetic, though I could not say that it is not also cancerous. In other words, my opinion, which I am unable to substantiate, is that *if it is cancer, it is a mixed lesion.* I think the indications

Fig. 7. H. D., female, aged 14. Syphilis of stomach, Type 2. Note the dumbbell-like deformity due to extensive infiltration about the body of the stomach in a case of congenital syphilis.

are very strong for thorough saturation with mercury and such other antiluetic treatment as may be deemed advisable and safe. It is probable that there will soon be extensive ulceration, and I think no time should be lost in beginning treatment." Dr. Crawford's report on the microscopic examination of sections removed confirms his previous findings. He adds that "no evidence of malignancy is observed."

The patient was placed upon active antisyphilitic treatment at my request by Dr. Charles McKendree, after which he gained ten pounds in weight and wrote me as follows: "I started with Dr. McKendree down to 164 pounds five weeks ago, started gaining, am now 173 pounds, and feel stronger than at any time for five months back."

Comment: The gastric lesion was very far advanced when the patient was placed under treatment and improvement was only temporary under antisyphilitic treatment. The patient died about five months later. No autopsy was obtained. The best obtainable evidence appears to be that afforded by the *gastroscopic* examination and histo-

Fig. 8. D. F., male, aged 54. Syphilis of stomach, Type 3. Note the marked infiltration of the middle of the stomach.

logical sections which were negative for carcinoma. This case might be considered one of a combined syphilitic lesion and carcinoma, as suggested by Dr. Jackson and as described by Wile (5). The case illustrates the necessity for early recognition of a syphilitic lesion of the stomach, followed by appropriate antisyphilitic treatment. It also shows the value of gastroscopic examination and removal of sections for microscopic examination, thus avoiding an exploratory laparotomy.

CONCLUSIONS

(1) The roentgen-ray evidence affords the best means of making a tentative diagnosis of syphilis of the stomach.

(2) Demonstration of improvement after antisyphilitic treatment in the ana-

tomical appearance and functioning of the stomach, together with improvement in the physical condition of the patient, such as gain in weight, cessation of vomiting, and disappearance of pain or distress after ingestion of food, tends to confirm the diagnosis.

(3) The gastric involvement in syphilis is more extensive than in simple ulcer and may be *as marked as in gastric carcinoma.*

(4) The absence of history or signs of syphilis, a negative Wassermann reaction, or even the histological appearance of a section from the stomach (unless accompanied by the demonstration of *Spirocheta pallida*), do not exclude the possibility of the presence of syphilis of the stomach; nor, on the other hand, does a positive Wassermann reaction prove the specific nature of a stomach lesion.

(5) The presence of a palpable tumor, absence of free hydrochloric acid, and loss of weight, unless accompanied by unquestionable roentgen appearances of gastric carcinoma, should never lead to a final diagnosis of carcinoma of the stomach; but, on the contrary, in atypical cases, the patient should be given the benefit of antisyphilitic treatment as a therapeutic test.

(6) Gastroscopic examination, together with removal of a section for microscopic examination, may at times be of the greatest value in making the diagnosis of syphilis of the stomach.

(7) Definite proof of syphilis of the stomach rests upon the demonstration of the presence of *Spirocheta pallida* in the gastric lesion. However, to afford a basis for treatment, roentgen-ray evidence is sufficient to give the patient the benefit of antisyphilitic treatment and to avoid extensive resection of the stomach. Certain cases may require operative relief by the performance of a simple gastroenterostomy.

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RADIO-ACTIVE SUBSTANCES AND THEIR THERAPEUTIC USES AND APPLICATIONS

RADIOTHERAPY OF CANCER OF THE UTERINE CERVIX

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V. FRENCH METHODS OF APPLICATION

THOUGH all French radium therapists are very punctilious in acknowledging that it was Abbe, of New York, who first applied radium to cancer of the uterine cervix, the practical demonstration of the peculiar adaptability of this element to the treatment of this particular lesion was the work of the French themselves, and even to-day it is to them that we must look for leadership in this most important branch of radium application. For this reason, the technical methods employed by the gynecologists and radiologists of France are of the utmost interest to all who are devoting any considerable part of their attention to this branch of therapy, and a careful review of these methods is essential to an intelligent understanding of the progress which has been made in the treatment of cervical malignancy.

The earliest workers were Wickam, Degrais, Dominici, Rubens-Duval and Cheron, all of whom met with considerable success in combating the ravages of this deplorably prevalent neoplasm by means of the newly discovered element. Dominici, in particular, was able to employ the penetrating gamma rays—segregated by powerful filtration—with excellent effect, and as early as 1909 demonstrated the selective action of these rays upon the malignant cells of cervical cancer, while at the same time he was able to show their relative harmlessness to the cells of healthy tissue. As Mallet recently put it: "Because of its frequent occurrence and its easy accessibility, cancer of the cervix uteri has offered a peculiar suitability for the researches of curietherapists. Moreover, the fact that the conditions obtaining in this area are favorable for application of radium to the center of the neoplasm, as well as the histologic sensitivity of the lesion, have contributed not a little to the early success which attended this particular application of radium treatment."

Régaud, the associate of Madame Curie, is perhaps the best known user of radium treatment in France to-day, so it is natural that we, on this side of the Atlantic, should consider his technic as the most important offered by the country where our knowledge of this treatment had its origin. In the opinion of this authority the use of a large number of centers of radio-activity is a primary requisite to the efficacy of the therapy. These centers may be located in the cervical canal, in the vagina, in the rectum, in the parametrium—by means of implantation, or upon the external surface, where radio-activity may be brought into play by X-ray or flat radium applicators. But in practically all cases, the most useful sites for the location of radio-active centers are the uterus and the vagina.

If the cervical canal is open and permeable without dilatation to an applicator of small caliber, this container should always be so fashioned as to occupy the entire length of the canal. Use may be made of several tubes of radium in thin filter sheaths, but the question of filtration must always be regarded as of paramount importance. The primary filtration which Régaud and his co-workers have employed for some time past consists of a platinum sheath 1.5 mm. in thickness; secondary filtration is accomplished by the use of a rubber tube, provided with an aluminum lining, from 0.1 to 0.2 mm. thick. Platinum-filtered containers to the number of one, two or three are introduced into a tube of gum or rubber, so as to constitute an applicator of suitable length, and this is gently inserted into the uterine canal, all possible aseptic precautions being observed.

If the cervix has been destroyed by the malignant process and the cervical canal is occluded by friable tissue, the procedure will have to be carried out in two stages. Primarily, vaginal applicators are placed in the cavity which has resulted from the destruction of the cervix, a medium dosage being employed. At the end of two weeks the surface will usually be cleaned up and smoothed out so that the canal can be entered, and the radium applicator placed in position as previously described. If there is hyperplasia of the cervix and closure of the uterine canal, the vaginal mass can be reduced only by "radium puncture," which is accomplished either by the introduction of radium needles or the implantation of bare tubes after Janeway's method.

The source of radio-activity should be placed in the vagina with the utmost care and its site thoughtfully selected, for burns of the vaginal mucosa are very serious affairs, much more so than those of the uterine mucosa. The dilatability of the vagina permits us to augment the distance between the radium and the vaginal mucosa: the primary filtration should be of platinum from 2.1 mm. to 2.2 mm. thick, or it may be of gold, 2.5 mm. thick. The secondary filter consists of a covering of aluminum 0.1 to 0.2 mm. in thickness, with a second covering of paraffined cork, of a depth of 7 mm. When possible, this applicator should find a place in the lateral culs-de-sac, and be held in position by the colpostat, a spring pessary especially designed for this purpose. When for any reason this spring contrivance cannot be used, the radium applicators are placed in sheaths of paraffinated cork and held against the cervix by any available dressing.

In order to accomplish cure, it is essential to give the strongest dosage which will leave the normal tissues uninjured, especially considering the sensitivity of the vaginal mucosa. A single treatment should suffice; fractional dosage and successive applications constitute—in Régaud's opinion—a very poor method. Attempts at curative treatment become dangerous when the extent of the malignant lesions is such as to demand a dosage so strong as to be injurious to the adjacent healthy tissues.

Debierne and Régaud have adopted the unit of millicuries of radium emanation given off in an established period of time as a measurement of dosage. When undertaking curative therapy of the malignant uterine cervix under exact conditions of filtration and of the number and position of all the centers of radio-activity, they do not think it necessary to arrange for more than 0.4 or 0.5 millicurie per hour of emanation, the required dose being 40 mc. emanated in four or five days. It should be so arranged that six centers of radio-activity give off 0.45 mc. per hour, and this can be accomplished by using three tubes providing 100 mc. hours each, and three tubes which provide 50 mc. hours in the same length of time. A tube capable of giving off 100 mc. hours contains 6.66 milligrams of radium, and a 50-millicurie-hour tube contains 3.33 milligrams of the element. A total of 60 mgr. of radium element will, therefore, be necessary. The minimum dosage when no contra-indications are present is 40 millicuries destroyed, to produce which all the tubes should remain in place for 89 hours.

The standards set by Régaud and his immediate associates are followed very closely throughout France. Mallet, for example, has estimated that for a basal-cell epithelioma of the cervix a dosage of from 45 to 50 millicuries is necessary, but that such dosage must be distributed over five or six days. To accomplish this he places in the cervical canal two tubes of 15 milligrams of radium element, each filtered by at least 1 mm. of platinum and a 2 mm. thickness of black rubber, and in the vagina —approximating the culs-de-sac—two 10 mgr. tubes, having a primary filtration of not less than 2 mm. of platinum. These tubes are separated from the vaginal mucosa by gauze packing from 8 to 10 mm. deep. This packing serves to protect the rectum and bladder from the effects of the

gamma rays, and also brings about a better distribution of the gamma rays over the malignant area. Mallet believes that 45 to 50 mc. is as large a dose as may safely be used without injury to the surrounding structures. The effect of the rays is rapidly decreased by distance, and to offset this the employment of numerous centers of radiation is essential. It is for this reason that additional tubes are placed in the vagina. The gain, however, is not so great as could be desired, for when the distance reaches 4 or 5 cm. the malignant cells appear to be altogether beyond the lethal effects of the gamma rays, or else the effect is merely an exciting or activating one. This leads Mallet to conclude that "at present radium applications made via the natural passages are not wholly satisfactory," for he has witnessed numerous recurrences after apparent cures by radiotherapy. He does, however, make the suggestion that a number of radio-active centers can be placed in the abdomen—making them no stronger than 2 milligrams—the implantation being in the depths of the broad ligament, as was advocated by Proust and himself in 1921.

Very prominent among French workers are those connected with the Hospital Tenon, of which Proust is chief surgeon, and De Nabias, a very active assistant. Several widely used applicators which are just beginning to be imported into this country are the invention of De Nabias, and the name of Proust is perhaps more quoted in French periodical literature than that of Régaud himself. In describing the technic employed at the Hospital Tenon, Proust begins by saying that the caustic action of the radium rays must be obliterated if we are to expect any therapeutic success, because of (1) the intractability of radium burns and radium dermatitis; (2) the dangers of infection; (3) the possibilities of perforation, and (4) the likelihood of secondary hemorrhage, due to necrosis of the walls of the vessels without coagulation of their contents. Lacassagne has calculated the extent of the zone of caustic destruction; he found that around a ten-milligram tube of radium, filtered by one millimeter of platinum, there was no zone of necrosis. In Proust's opinion, however, this amount of filtration should be increased in those containers which are designed for the vagina. Dominici's great contribution to radiotherapy was his demonstration of the utility of filtration which can screen out all but the hard gamma rays, so as to have a homogeneous irradiation, the action of which remains sufficiently constant to permit its diminishing with the square of the distance, making possible a dose which will destroy neoplastic tissue, while at the same time the normal tissues remain uninjured. The passage of years has only served to emphasize how well founded was Dominici's contention. Little by little the details of technic have been perfected until to-day the plan for radium treatment of the cancerous cervix may be outlined as follows:

There is a definite limit to the strength of the dosage which may be employed in the vagina without fear of fistula-formation, radium burns, necrosis or intractable proctitis or cystitis, and any of these may occur when insufficient filtration is employed. This dose limit is 6,000 mgr. hours, equalling 60 *centaines* of milligram hours, and corresponding roughly to 45 mc. hours' decay. In general, it will be recalled, the number of millicuries given off corresponds to three-fourths of the figure expressing the number of *centaines* of milligram hours. Favorable results can be obtained from the application for one hundred hours (four days) of 60 mgr. of radium—30 mgr. being placed in the uterine cavity, and 30 mgr. in the vagina, divided between several centers. If preferred, 40 mgr. may be placed in the uterus and 20 mgr. in the vagina. In special cases this dosage may be increased. When there is a large proliferation of the growth into the vagina which must be cleared away by radium implantation, some of the centers of radio-activity may be inserted by the abdominal route, but when we have only a simple utero-vaginal application to make,

45 millicuries will generally prove sufficient.

In regard to filtration Proust lays down the rule: Employ stronger filtration for the vagina than for the uterus. The uterine applicators should have at least 1 mm. of platinum, and those for the vagina double that amount, a thickness of not less than 2 mm. A one-millimeter platinum filter lets pass a third of the soft gamma rays, so that the imposition of another millimeter thickness will cut off all but a third of that third—that is, about all but 11 per cent. The secondary rays must also be cut off, and this may be brought about by adding 0.01 mm. of aluminum for every millimeter of platinum, plus a covering of rubber which contains no metallic element, so fashioned as to provide an interval of not less than one centimeter between the radium container and the vaginal wall.

A second rule laid down by this authority is that the vaginal application of radium is contra-indicated when there is any considerable malignant invasion of the recto-vesical or vesicovaginal septa.

Proust also recommends the use of a pessary to hold the three centers of radio-activity in place. He mentions Régaud's device—the colpostat—which consists of a flexible spring enclosed in a rubber tube, at the extremities of which are attached the cork sheaths holding the radio-active containers. Régaud recommends inserting three tubes in the uterus, two holding 13.33 mgr. and one 6.66 mgr., making a total dosage of 33.32 mgr., with 26.66 mgr.—also divided among three tubes—in the vagina. This, applied for 100 hours, gives radiation approximately equal to 45 millicuries. All such applicators should be capable of undergoing surgical sterilization, and not merely be passed through alcohol, as has been the practice heretofore. When the tubes are left for four days they must be withdrawn each day for re-sterilization, and the entire cavity be thoroughly douched before they are replaced.

Often the presence of neoplastic overgrowth in the cervical canal will prevent the application of radium tubes within the uterine cavity. Under such conditions a preliminary application of radium may cause this redundant mass to slough off, leaving the canal open, but frequently it will be necessary to have recourse to "radium puncture," either with filtered needles or the "bare-tubes" of Janeway, filled with radium emanation, these being little capillary tubes of glass having no other filtration than the walls of the container. The needles recommended by Régaud, who has improved upon Stevenson's technic, are of iridiated platinum, 0.3 mm. thick, containing condensed emanation. They are driven directly into the substance of the tumor. The "Janeway tubes" are placed by first puncturing with a trocar, the tube being thereafter pushed down the trocar with an obturator and left in place directly in the neoplastic tissue.

The technic which De Nabias employs does not differ from that of his chief except perhaps he is inclined to extend the indications for radium therapy somewhat farther. He asserts that "In radium we have a truly marvelous means of curing cancer of the uterine cervix, provided that it is applied by a properly perfected technic—lacking which, however, the whole therapy is liable to be vitiated by serious and even fatal faults. To avoid these distressing accidents one has only—

"1. To apply it only in those cases where there are no adnexal lesions and no secondary infection of the malignant process. Such infection can be readily detected by watching the temperature curve, and by the perception of a slight resistance to abdominal palpation.

"2. To use abundant filtration.

"3. To keep the source of radio-activity invariably at a distance of at least one centimeter from the walls of both rectum and vagina.

"4. To make very long applications in those histologic forms which show little active cell-division."

There is every evidence that surgery as a treatment for every form of cervical cancer is steadily losing ground in France, and the immediate prospect of its total abolition seems not unreasonable. Certainly the advances which French therapists have made in the treatment of this dread disease are great enough to inspire confidence in the ability of radium to cope with this lesion far better than any other treatment which has ever come to notice.

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CALIBRATION AS AN AID IN THE STANDARDIZATION OF TECHNICAL PROCEDURE

By E. C. JERMAN, Chicago

ONE of the greatest handicaps in the average laboratory has been the difficulty in duplicating results. A beautiful radiograph is produced, the tube, film, screen, dark room procedure, distance, time, milliamperage and gap are all carefully noted, but when the attempt is made to duplicate, failure often results. A stereoscopic pair are made and one may be decidedly darker than the other even though a careful attempt has been made to deliver the same energy to each film. A beautiful technical result was obtained yesterday or last week. To-day a seemingly similar procedure fails completely to duplicate the result.

The predominant factor responsible for the failure to duplicate results has been the voltage or gap factor. The tube, film, screen, dark room procedure, distance, time and milliamperage may be duplicated with little difficulty, but due to quite ordinary line fluctuations and to the inaccurate point gap method of measuring the voltage or gap, it has been found exceedingly difficult to duplicate this factor. The inaccuracy of measuring the gap in inches by the point gap method forced its being discarded in deep therapy, and should force the discontinuance of its use in diagnostic work as well, especially as a better and more accurate method is now available. A five-inch gap as measured and used by one individual may have an entirely different value as measured and used by another individual. A five-inch gap as measured and used by one individual at one time may have an entirely different value as measured and used by the same individual at another time.

The point gap method is affected by so many factors, such as humidity, temperature, altitude, sharpness or bluntness of points, etc., that duplication of the energy to be delivered by this method is impossible.

Any autotransformer-controlled machine, with mechanical rectification, can be calibrated within its capacity.

Calibration necessitates that the machine be equipped with a pre-reading voltmeter. A pre-reading voltmeter should be a standard voltmeter connected in the circuit between the autotransformer and the high tension transformer which reads the voltage delivered from each button of the autotransformer to the primary of the high tension transformer, with the X-ray switch open or off.

A standard sphere gap with the proper altitude K.V.P. scale should be used.

The average time required for full calibration is approximately three hours. The value of the calibration method depends entirely upon the accuracy with which the work of calibration is done.

Calibration at the higher milliamperages requires the utmost care in order that damage to the tube may be avoided.

The following Calibration Chart is a copy of the result of the calibration of a Snook machine. This machine has 23 buttons of rheostat control and 30 buttons of autotransformer control. When operating the machine from a diagnostic standpoint, Rheostat 23, or Rheostat "entirely out," is always used. It will be noted that the pre-reading voltage (autotransformer voltage) for each button of the autotransformer is given as found at the time of calibration. It will also be noted that the K.V.P. for each autotransformer button at its pre-reading voltage at the time of calibration is given for each milliamperage ordinarily used.

Following calibration, the autotransformer button numbers should not be used except as a guide. A variation of the line voltage will cause a corresponding variation of the pre-reading (autotransformer) voltage for each button of the autotransformer. A definite autotransformer volt-

CALIBRATION CHART

(In which a Snook machine was used)

Rheostat out, on Button 23

Auto-transformer Button	Auto-transformer Voltage	*Kilo Volts Peak* at 10 ma.	at 20 ma.	at 30 ma.	at 40 ma.	at 50 ma.	at 100 ma.
1	65	45	45	37.5	36	33	23
2	69	50	47.5	40	38	35	28
3	73	54	50	45	42	40	32
4	77	57	52	49	47	45	36
5	81	60	55	52.5	50	48	40
6	86	64	57.5	55	53	50	42
7	91	67	60	58	56	53	45.5
8	95	70	65	62.5	60	56	49
9	100	73	70	66	63	60	52
10	105	77	73	70	65	63	55
11	110	79	76	73	70	67.5	57.5
12	115	82	79	76	72.5	71	62
13	120	84	82	80	76	75	64
14	125	86	85	82.5	80	78	67
15	130	90	87.5	86	84	81	71
16	135	93	90	88	86	84	75
17	140	96	94	92.5	89	87	77.5
18	145	99	97	96	93	90	80
19	150	103	100	98	96	94	83
20	155	106	104	102	100	97	87.5
21	160	110	108	106	103	100	91
22	165	113	111	110	107.5	104	94
23	170	117	115	113	111	107	97
24	175	120	118	116	114	111	100
25	180	123	121	119	117	114	104

age at a given milliamperage will always produce the same K.V.P. Therefore, in order to produce a given K.V.P. at a given milliamperage, it is necessary to use the same pre-reading (autotransformer) voltage that was used at the time of calibration, regardless of autotransformer button numbers.

THE USE OF THE CALIBRATION CHART IN ROUTINE WORK

Suppose it be desired to use 40 milliamperes at 100 K.V.P. By reference to the 40 ma. column, running down to 100 K.V.P., it will be found that 155 pre-reading (autotransformer) volts are required. It will also be found that, at the time of calibration, autotransformer Button 20 gave the required 155 volts. If at any time autotransformer Button 20 fails to give 155 volts, the autotransformer button should be selected which will give nearest to the 155 volts.

If, with any given exposure, the pre-reading voltage and milliamperage are known, by reference to the chart, the K.V.P. used may be at once found.

Suppose that a satisfactory radiographic result is obtained with an exposure of eight seconds at 10 ma. and 86 K.V.P., and it is desired to produce a similar density with an exposure of two seconds. The time being shortened to one-fourth, the ma. should be increased four times, or to 40, with the K.V.P. remaining constant. By reference to the chart it will be found that while 125 pre-reading volts deliver 86 K.V.P. at 10 ma., at 40 ma. 135 pre-reading volts are required to produce 86 K.V.P.

The principal advantage to be obtained from calibration is the fact that a definite K.V.P. (gap, voltage, or penetration) at a given milliamperage may be consistently duplicated by reference to the pre-reading (autotransformer) voltage column.

If a stabilizer is used for the control of milliamperage, the calibration chart eliminates the necessity of testing the tube.

THE TREATMENT OF PYOGENIC INFECTION BY ROENTGEN IRRADIATION [1]

By JOHN D. LAWSON, M.D., Department of Radiology, Woodland Clinic, Woodland, California

IT seems to me that, in recent years, too much attention has been paid to the treatment of malignancy and its allied conditions, to the utter neglect of some phases of radiotherapy from which more satisfactory results may be obtained. Too many physicians believe that the word "radiotherapy" is synonymous with "cancer therapy," and this belief is the fault of the roentgenologist who for the past seven or eight years has devoted all his time to urging cancer therapy by means of X-ray treatment.

I have purposely selected pyogenic lesions as the subject to be discussed because of the lack of literature concerning them. We have access to no end of papers and discussions on the treatment of hopeless malignancy and on the treatment of various leukemias, but when we look for the more every-day conditions, such as boils and carbuncles, we find only a few writers mentioning them.

I believe that, in the near future, we shall find the trend of the roentgenologists, in increasing numbers, toward the treatment of these more common conditions, in addition to the many and varied non-malignant dermatological entities.

The results of radiotherapy in the treatment of malignancy have not been such as to warrant the many extravagant claims which have been made for it, although it is of extreme value in many cases. On the other hand, we find very satisfactory results, with a high percentage of cures, following roentgen irradiation of dermatologic pathology based on staphylococcic and streptococcic infections.

For this presentation I shall divide pyogenic infections into two main classifications: (1) acute, (2) chronic. Under the first classification we have furunculosis, carbunculosis and cellulitis. This last, in turn, may be divided into erysipeloid and phlegmonous types. Under the heading of chronic conditions of pyogenic origin we most frequently meet with acne, pustular dermatitis and infected granulomata.

All of these conditions, with the exception of the phlegmonous type of cellulitis, have been treated at the Woodland Clinic with excellent results. There is an unusual opportunity for one situated as is the writer, working with a group, as the entire staff is intent upon the production of the best result, regardless of the method used. The type of therapy best suited to the individual is chosen in each case.

The average physician sees an individual with an early boil and, without more ado, incises it. He knows that the patient will probably recover by this procedure without any great inconvenience. He does not stop to consider that by irradiation this lesion would most likely heal without pain or scar. Possibly he does not know it. I believe that less than 10 per cent of practising physicians know that these processes can be arrested by X-ray therapy.

In considering this subject we must note the advantages of irradiation over surgery. I believe them to be five in number, namely:

(1) The natural barrier of Nature is not disturbed by irradiation.

(2) There is no danger of a new type of bacteria being introduced.

(3) The treatment is painless.

(4) There is prompt relief from pain.

(5) There is no ultimate scar.

Taking these advantages up one by one: The natural barrier of leukocytes thrown out by Nature is there for a purpose. The surgeon cannot see the beginning nor the end of this barrier. He incises into the infected tissues and hopes he does not disturb Nature's protective wall. Very often we see an extension of the lesion, caused, I believe, by the surgeon's knife.

[1] Read before the Pacific X-ray Society, June, 1925.

The second point, that of the introduction of a new type of flora, has been exemplified very forcibly at our Clinic twice within the last year. In each case the referring physician sent in a patient suffering from an abscess of the buttock which had already been incised. In each instance septicemia had developed before entry into the hospital. One of these patients died. There is no doubt but that there is considerable mortality from just this one cause.

The lack of pain need not be commented upon except to say that, although the surgeon believes he is accomplishing his result without much disturbance of the sensory apparatus of the patient, the latter usually does not agree with him. Both physician and patient agree that irradiation is painless.

With regard to the fourth heading, I have found relief from pain to be present in all of my patients, the relief coming on from two to twenty-four hours after irradiation. I cannot account for the prompt subsidence of pain in a few of these cases where it occurred very early (two or four hours after irradiation) except upon the supposition that there is some local reaction either upon the nerve endings or upon the infiltration present. We know that it occurs and is more prompt than the relief obtained surgically.

The fifth instance also needs no discussion as there will be no more scar than is produced by the pathologic process itself.

Furuncles and boils in general yield more rapidly to radiotherapeutic measures than to any other type of therapy, according to our observation. Both patient and physician are generally pleased with the results accomplished. In irradiating a boil we include some of the surrounding area in a portion of our dosage, thereby preventing the usual "crop," consisting of a parent infection with several smaller ones in the immediate neighborhood.

There is another acute type of infection which, to my mind, should never be treated surgically. I refer to lesions of the face above the mouth. I believe surgeons in general will agree that this is one of the most dangerous of all infections, owing to the probability of meningitis, and that incision and drainage rarely constitute a satisfactory method of therapy. We have had fifteen such cases, all of which have been satisfactorily treated by long wave therapy.

Of course the age of the lesion at the time of irradiation is an important consideration. The earlier an acute lesion is treated the more prompt is the result and the more likely is a cure without suppuration. I may state that, in our experience, we have had few cases in which suppuration followed irradiation, except where the lesion was broken down before treatment was instituted.

Treatment after suppuration has begun will shorten the length of time during which we would ordinarily expect the lesion to be present and active, and the discomfort and pain attendant thereon are relieved quite promptly. Carbuncles the size of a dollar will have their courses shortened by a week or ten days even though at the time of irradiation the whole area is showing evidence of slough. If suppuration is already present and there is a pocket of pus, this should be evacuated surgically, but the irradiation should also be applied at the same time.

Five cases of erysipelas have been treated by long wave irradiation, all of which yielded promptly. One patient had been treated medically for one week with a gradual extension of the process, until at the time of irradiation the entire upper half of the trunk was involved as well as the face and arms. There was absolutely no progression of the disease from the time of treatment and the patient was discharged from the hospital five days after the dosage had been administered.

The chronic, infectious skin conditions, especially acne, have been discussed at a greater length in the literature, and for that reason I will not go into the consideration of this subject in any detail. I think that by this time all dermatologists and roentgen-therapists agree that the method of

choice in the treatment of acne vulgaris is that of X-ray therapy, though, of course, not to the exclusion of dietary and hygienic regulations.

Pustular dermatites of pyogenic origin may become chronic and extremely resistant to the ordinary methods of treatment. These, however, yield very promptly under X-ray therapy. The same is quite true of infected granulomata, especially those showing some keloid properties.

The technic used at the Woodland Clinic in the treatment of all acute processes and infectious granulomata consists in administering a full erythema dose of unfiltered radiation, the voltage varying from 70 to 100 kilovolts. It is my opinion that no particular voltage between these limits has any advantage over another so long as a full erythema dose is given. There seems to be a peculiar condition in these cases in that two or even two and a half erythema doses may be given to a patient within a week without the usual signs of skin irritation or damage. Never yet have I observed a case where there was any evidence of over-irradiation, although I had exceeded the normal tolerance by 100 to 200 per cent. If there is not complete subsidence of the lesion, or at least a very marked subsidence, after forty-eight hours, another irradiation of one-half erythema dose is administered, this being repeated again if necessary at the end of another forty-eight hours.

In the treatment of chronic types the same factors are used, except that about one-fourth of an erythema dose is given at intervals of three days for three doses, after which time about one-sixth of an erythema dose is given weekly.

In presenting this subject I have not the idea that I am bringing forth something new, but am merely stating that it is my opinion that the method of choice in the handling of pyogenic skin infections is that of long wave irradiation.

CHOLECYSTOGRAPHY

OBSERVATIONS ON THE ORAL ADMINISTRATION OF SODIUM TETRAIODOPHENOLPHTHALEIN

By JOSEPH W. LARIMORE, M.D., St. Louis, Missouri

THE amount of free hydrochloric acid in the gastric secretion of a subject for cholecystography after the method of Graham, Cole and Copher,[1] but by oral administration of the sodium tetraiodophenolphthalein, is a factor in the intestinal reaction to the chemical, and influences the resulting cholecystogram. Organic acids present in the stomach and small intestine will act in the same manner. The free hydrochloric acid is, however, the usual and chiefly effective acidity.

Carman[2] noted catharsis, rarely after oral sodium tetrabromphenolphthalein, usually after enteric-coated pills of sodium tetraiodophenolphthalein, but less often after plain gelatin capsules of the latter salt. Palefski[3] noted the alimentary reaction with duodenal administration and gave morphine and atropine to counteract it. Whitaker, Milliken and Vogt[4] in forty-four instances of oral administration of the sodium tetraiodophenolphthalein noted vomiting five times, slight nausea seven times, and mild diarrhea five times. Menees and Robinson[5] noted in thirty-seven instances of oral administration of the sodium tetrabromphenolphthalein slight looseness of the bowels seven times and vomiting ten times. Stewart[6] noted after duodenal administration in three cases vomiting once and a slight diarrhea once.

Among sixty-five cases receiving orally sodium tetraiodophenolphthalein, there occurred thirteen instances of an alimentary reaction, with diarrhea, with from two to six liquid stools, and all of these showed an achlorhydria. In five of these cases there was associated nausea and vomiting. Four cases showing free hydrochloric acid had vomiting only, no diarrhea. One case of clinical diarrhea showing an hypochlorhydria gave no definite increase in the diarrhea. All cases having an achlorhydria gave but a faint or no gall-bladder shadow, and by opacities in the alimentary canal gave little or no X-ray evidence of undissolved dye. X-ray evidence of undissolved capsules or dye has appeared in only one case which showed no free hydrochloric acid, and in those having free hydrochloric acid has appeared, roughly, in direct proportion to the degree of acidity. These observations were made in a series of private cases.

Cholecystography, by oral administration of the dye, has been recently incorporated into the office routine of the clinical, laboratory and roentgen examination of gastro-intestinal patients. Five one-gram, salol-coated (single coat) capsules of sodium tetraiodophenolphthalein are taken with water by the patient, following the evening meal, and the first film is exposed at eleven or twelve hours, just prior to starting a barium study of the gastro-intestinal tract. The relation of the free hydrochloric acid in the stomach to the alimentary tolerance of the dye soon becomes apparent from the co-relation of the data on each patient. There has been no association of the reaction to the weight of the patient (the per kilogram dose) nor to the blood pressure, which is an associated factor to the circulatory reaction after intravenous administration. Faint shadows of the gall bladder have so often been associated with high free hydrochloric acid and with associated X-ray evidence of lack of solution that it is considered probable that the effective (absorbed) dosage is reduced by and in proportion to the free hydrochloric acid of the gastric secretion. The cases considered in this review have not received laparotomy. Of the whole number, only two cases have positive evidence of stones and of these two, in one having free hydrochloric acid, the gall bladder filled by the sodium tetraiodophenolphthalein, and in the other having an

achlorhydria, a concomitant of malignancy, the gall bladder did not fill. In only two other cases of the series was there clinical suggestion of gall-bladder disease, and that inconclusive. Since making these observations, we have had routinely in all cases at the Washington University X-ray laboratory receiving the oral test, a full abdominal film at the time of the first gall-bladder film, and notes of any alimentary disturbance have been made. In all cases showing diarrhea after the dye and in whom the data were available, there has been an achlorhydria.

These observations have been interpreted as showing a toxic (pharmacologic) influence upon the alimentary tract when the full dose is effective. There exists in association with achlorhydria a tendency to alimentary hypermotility often manifested by a morning diarrhea traceable to hydrochloric acid medication. In spite of this tendency, full solution of the dye probably gives an actual rather than a relative overdose in these cases. In the presence of hydrochloric acid, sufficient of the dye is precipitated to reduce the absorbed dosage to within the tolerance of the patient, and at times the acidity is adequate to interfere with the disintegration of the salol-coated capsules.

A gall-bladder shadow of greater density has been secured in cases showing normal gastric acidities (no reaction) than in those with diminished and absent acidity, although it is thought that in the latter instances larger amounts are absorbed. This may be explained by the untoward influence of the alimentary peristalsis and secretion upon the gall bladder, which may also share directly in the excitation by the drug. A diarrhea intercurrent with cholecystography by the intravenous method may reduce if not prevent gall-bladder filling, or cause its untimely emptying. The possibility of the fecal evacuation of the dye as the result of alimentary hypermotility is undetermined by these observations; the purple color of a liquid evacuation was reported by one patient.

SUMMARY

The effective dose of sodium tetraiodophenolphthalein, as used orally for cholecystography, is determined by the free acid of the gastric content, usually and chiefly hydrochloric acid. When using five grams of the dye in five salol-coated capsules the cholecystogram has been disturbed (1) by the alimentary reaction following the full solution of the dye permitted by gastric achlorhydria, and (2) by inadequate solution of the dye resulting from full active hydrochloric acid gastric secretion which precipitates the dye or prevents dissolution of the salol-coated capsules.

CONCLUSION

In the use of cholecystography by oral administration the control of the alimentary factors is essential. Interpretation should consider the alimentary reaction, and the evidence in an abdominal film of any opacities of residual capsules or the precipitate of the dye. Only a definite gall-bladder shadow has a clinical value. The absence of a shadow in the oral test is inconclusive, especially when there is associated an alimentary reaction or a large alimentary residuum of the dye. Reduction of the dose, and achievement by further experiment of better control of the alimentary factors may be expected to give more constancy to the results of cholecystography by oral administration.

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Osteomyelitis of the skull. — The author concludes that this condition is more frequent than the literature would lead us to believe. The etiology and pathology of osteomyelitis of the skull he believes to be the same as that advanced for the same disease in the long bones. Previous infections play an important part and staphylococcus is the principal offender. Cases of skull involvement following osteomyelitis of the long bones are infrequent, and metastatic infection of other bones following skull involvement is still less frequent. The frontal bone is most often the seat of the infection. The order of incidence of infection in the other bones is, temporal, parietal, and occipital. The contiguous sinuses and the middle ear will explain the order of frequency. The spread of the infection is most often toward the vertex rather than toward the base. In children the periosteal partitions may localize the infection to one bone, but in adults it may spread rapidly from one bone to another.

The symptoms are usually not so severe or extensive as the pathologic process found at operation would indicate. The X-ray does not reveal the evidence of osteomyelitis till the process is well advanced. The author reports three cases as representing seven that he has seen, three in children and four in adults. In all cases the infection followed trauma.

F. B. Sheldon, M.D.

Osteomyelitis of the Skull. Howard Fleming. Calif. and West. Med., Aug., 1925, p. 985.

Use of laryngeal catheter.—The writers of this paper describe the use of the laryngeal catheter in bronchial skiagraphy. Their method is as follows: They anesthetize the pharynx and larynx with a 10 to 15 per cent cocaine solution before passing a semi-rigid catheter having a terminal orifice and a thin flexible metal stylet bent to correspond to the curvature of the larynx. The horizontal oral portion of the catheter passes through a block or gag which is fixed between the teeth. The catheter is sufficiently small to allow the patient to breathe easily throughout the examination. To the proximal end of the catheter is attached a small oil pump or Junker's apparatus, controlled by a screw valve which regulates or closes the caliber of the air tube of the apparatus, thus regulating the flow of the 40 per cent iodipin solution. They recommend that if this solution causes coughing, the rubber tube should be detached from the catheter and the interior of the larynx and trachea sprayed through the catheter with a cocaine-adrenaline solution. They report that the technic is simple and easy, that it remains throughout under the control of the operator, and that the iodipin does not come into contact with the mouth or pharynx. By means of the fluoroscopic screen the skiagrapher can watch the flow of the solution into each bronchus, the patient's position being varied to assist and regulate the passage of the fluid. They believe that by this procedure the diagnosis and treatment of diseases of the lungs and bronchi, especially in regard to bronchiectases and tuberculous cavities, will be much facilitated.

Bronchial Skiagraphy. O. Beck and M. Sgalitzer. Zentralbl. f. Chir., July 11, 1925, p. 1537. (Reprinted by permission from Brit. Med. Jour., Aug. 22, 1925, p. 24 of Epitome of Current Medical Literature.)

CASE REPORTS

VESICAL AND RENAL CALCULI IN CHILDREN

By C. E. PIERSALL, M.D., Director, Reno Radium-X-ray Association; Roentgenologist, St. Mary's, Washoe County and State Mental Hospitals, RENO, NEVADA

The purpose of this article is to report an unusually large, primary bladder stone and two stones apparently in the left kidney, in a three-year-old child.

Primary stones develop in an acid urine without any antecedent inflammation, but probably with infection as the cause. They may consist of uric acid, urate of soda, lime, potash, oxalate of lime, cystin, xanthin, carbonate of lime, crystalline phosphates of lime, or indigo.

Secondary stones which develop in an alkaline urine as a result of inflammation and probably infection may consist of calcium carbonate, and the phosphates of calcium, ammonium and magnesium.

Uric acid stones are found in 80 per cent of cases, according to Keyes. The causes of stone formation are obscure.

Primary calculi are rarely met among women. The influence of soil, climate, drinking water, occupation, diet, and the amount of salt consumed, seem to have a bearing on their formation. The increased density of the urine, the presence of colloid substances in solution with an excess of urinary salts, is probably the determining cause. The rate of growth of a stone varies greatly. Bladder stones are often met in infants. They are more common in males because of the longer and narrower urethra. Legneu quotes in his treatise on urology that Bokay, in 1,621 cases of calculi, found 1,150 among children.

D. F. Keegan, of India, reports a number of calculi in children; two in children three years old and two in children aged four and one-half years.

It seems that in this country few cases have been recorded. Lanngebeck found a vesical calculus in a six-months fetus. Brendel reports two cases of urinary calculi in infants two days after birth. Arthur reported a case of a child sixteen months old with multiple stones in the urinary tract. Thomas and Tanner have collected forty cases of vesical calculi in children not over five years of age, and they believe such are much more frequent than is generally supposed.

SYMPTOMATOLOGY

Pain occurs more frequently with kidney stones than with bladder stones, although pain may be absent. Hematuria, pyuria, dysuria, anuria, frequency of urination, nausea and vomiting may be present. The presence of a palpable object may be noted.

In small children who have bladder stones, prolapse of the rectum and involuntary defecation are common results of straining. Diagnosis can usually be made by means of roentgenograms and cystoscopy.

As a differentiation between urinary and other calculi, pyelography, or the introduction of opaque sounds, may be necessary.

The treatment is litholapaxy, suprapubic lithotomy and perineal lithotomy.

REPORT OF CASE

Male, age three years and forty-seven days; weight at birth, eight pounds; breast fed, drinking water hard and scaled or accumulated in containers.

Family history: Negative.

Personal history: Negative as to other diseases. When he was aged sixteen months his mother noticed a strong odor of ammonia from the diapers and also deep urine stains on them. The boy's appetite was good and he seemed to be in good health at that time, but was taken to a physician who gave him some medicine to clear the urine.

When the child was eighteen months old, his mother observed that when he defecated

Fig. 1. Anteroposterior view showing large, dense stone in bladder, and two smaller ones which appear to be in the left kidney.

Fig. 2. Lateral view of bladder stone.

or urinated he strained hard, which soon caused a tender, irritated anus, followed by hemorrhoids. Blood was passed, but the mother could not determine whether it was passed with the urine or the stool; the latter was loose in character.

Severe attacks of pain continued to occur from one week to one month apart and were always noted during the acts of urination or defecation. During the first week of October, 1924, a physician was again consulted. He attempted to pass a catheter. This was unsuccessful, so he informed the parents that the bladder contained a foreign body and prescribed treatment for cystitis, which did not improve the condition.

About November 1, a doctor in another State was consulted. He retracted the foreskin. This seemed to give relief for about a week.

On December 11, the child was taken to another town, where a circumcision was done and treatment for cystitis was given. January 1, they returned to their home in Nevada, where treatment for worms was given until February 1, 1925, when they came to the service of Dr. A. L. Stadtherr at St. Mary's Hospital. When they arrived, the baby had been having an attack of severe pain which had lasted six days, longer than any former attack.

The parents did not remember the weight of the baby since birth; they stated that he never appeared thin, always had a good appetite, never had much color and had always been nervous and slept restlessly.

Physical examination: Pale, pasty color; condition undernourished; tenderness over lower abdomen and small rectal hemorrhoids present.

Laboratory examination: The stool examination was negative. The urine was cloudy, albumin showed in a heavy cloud, some pus cells and blood cells, a few casts, micrococcus catarrhalis and bacilli resembling Hoffmann's were present. The blood examination showed 3,400,000 erythro-

cytes, 8,000 leukocytes, twenty-three small lymphocytes, six large lymphocytes, seven transitionals and sixty-four polynuclears.

X-ray examination: On February 2 and 3, X-ray examination of the urinary

Fig. 3. Photograph of stone before it was broken for examination. It has the appearance of a lump of hard brown sugar.

and gastro-intestinal tracts was made. The gastro-intestinal tract was negative, but the films of the urinary tract revealed two stones in the region of the left kidney, the upper one being about twelve millimeters in diameter, the lower one about half that size, and a large spheroid stone in the bladder about one by one and one-half inches in diameter as seen in anteroposterior and lateral views.

Operation: On February 4, under general anesthesia, the bladder stone was removed by Dr. Stadtherr and Dr. Caples by the suprapubic route. The stone was attached to the posterior wall.

Progress: February 20, the urine contained only a trace of albumin, no casts, few pus cells, B. coli and no blood.

The wound was healed by February 23, and the patient was discharged the next day.

A letter from the father dated July 15, 1925, stated that the child was perfectly well.

Dr. Alice L. Thompson reported the stone to be composed of uric acid with some calcium oxalate crystals. It weighed one ounce.

CHOLECYSTITIS WITH STONE PRODUCING AN ATYPICAL SHADOW: REPORT OF A CASE [1]

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A woman, aged forty-eight years, came to the clinic complaining of loss of weight and appetite over a period of nine months. She had had a severe attack of typhoid fever at the age of eighteen, but for many years had enjoyed excellent health. From November, 1924, to May, 1925, she had nursed an aged relative and was under an unusual strain. About February, 1925, she commenced losing weight. In seven months she lost 30 pounds. About May her appetite failed; she had no food intolerance, but food did not appeal to her and she ate less. There was no apparent loss of strength. For fourteen years she had experienced a sensation of pressure over the gall-bladder area. At times she thought she could palpate a mass. There was never any jaundice, nausea, or emesis. During the last week before coming to the clinic she suffered daily attacks of cramps in the upper abdomen, lasting for a few hours.

Physical examination elicited some fullness in the right upper abdominal quadrant, with rigidity of the right rectus muscle and tenderness in this region on pressure, but no definite mass. There was no suggestion of a lesion of the general urinary tract. A roentgenogram revealed a large calcified

[1] Received for publication October 28, 1925.

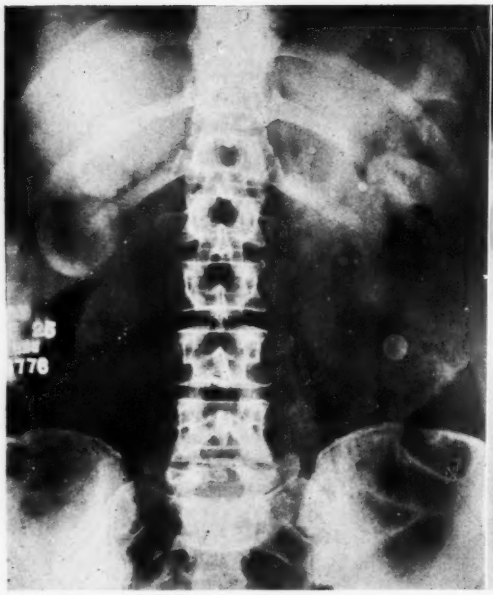

Fig. 1. Atypical shadow produced by a gall bladder containing a large stone and considerable grumous material. The gall bladder was thick-walled, rigid and calcareous.

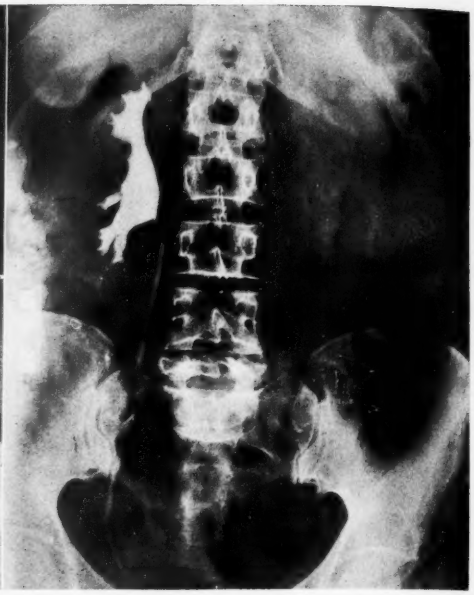

Fig. 2. A pyelogram demonstrated the shadow to be above the kidney.

area on the right side at the level of the first lumbar vertebra and below the shadow of this a second crescent-shaped shadow, apparently associated with the upper one (Fig. 1). A cholecystogram showed the absence of dye, and the shadow was similar to that in the roentgenogram. Urologic investigation failed to show any involvement of the urinary tract. The pelvis was shown by the pyelogram to be elongated and displaced downward and toward the median line, apparently as a result of pressure from an extrarenal mass (Fig. 2). The clinical diagnosis was cholecystitis with stone and calcification of the gallbladder wall, and exploratory operation was advised. This showed that the gall bladder was greatly distended and filled with a white grumous material, chiefly cholesterin (Fig. 3). The wall of the gall bladder was rigid and calcareous, and there was one stone 4 by 2.5 by 2 cm. Inspection of the gall bladder after removal gave the impression that the crescent-shaped shadow resulted more from the thick coating of the wall of the gall bladder than from calcification in the wall.

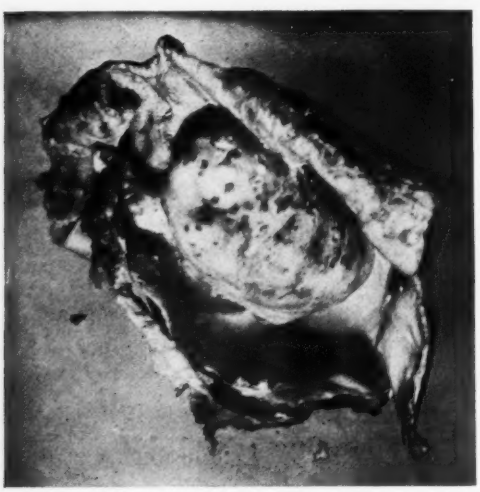

Fig. 3. Gall bladder showing a gallstone 4 by 2.5 by 2 cm. and a thickened wall smeared with a thick coating of the grumous material.

CONGENITAL STENOSIS OF THE ESOPHAGUS IN A WOMAN AGED 67: INVOLVEMENT OF CARDIA AND MIDDLE THIRD

By ROBERT A. ARENS, M.D., and ARTHUR R. BLOOM, M.D., Roentgenologist and Assistant Roentgenologist, Respectively, of Michael Reese Hospital, CHICAGO

The patient, M. L., female, aged 67 years, was referred for roentgen study by Dr. Alfred A. Strauss. She had complained for about forty years of difficulty in swallowing, and of vomiting two or three times a day soon after eating. The emesis consisted of undigested food particles and a large amount of mucous material. Solid food was better retained than liquids, while water and other fluids were immediately regurgitated unless taken in large quantities. Accordingly, she always drank one or two quarts of water at meals. Thirty-five years before, a physician had passed a tube into the esophagus, evidently in an attempt to dilate it.

About two months previous to the present examination she began to have a feeling of constriction or tightness at the third costal interspace in the midline. She was conscious of food stopping at this point. This sensation would cease after taking a large quantity of water or after regurgitation. The patient reported that for the past month when she reclined fluid poured out of her mouth. She did not seem to be able to control this phenomenon. She also complained of dyspnea and palpitation on exertion and of a constant cough, productive of a clear mucoid sputum. The appetite was good and she ate at frequent intervals. Except for having had typhoid fever during childhood her past and family histories were irrelevant.

The physical examination revealed nothing of importance other than that the patient was undernourished, weighing ninety-

Fig. 1. Lateral view showing dilated portion of esophagus above level of third thoracic vertebra with constriction below.

Fig. 2. Showing dilated lower end of esophagus extending below the diaphragm; also the constricted cardia and the small amount of barium in the stomach.

seven pounds. The pulse and respiration were normal. She ran an evening temperature of 99 to 99.2 F. The leukocyte count was 19,000, with 79 per cent neutrophiles. Urine and stool examinations were normal.

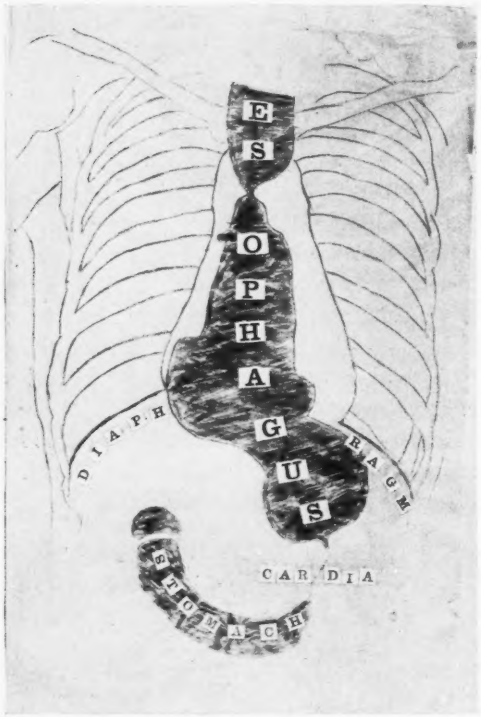

Fig. 3. Composite drawing.

A No. 30 bougie was passed easily, while a No. 34 met with obstruction at 42 centimeters.

A fluoroscopic examination disclosed a marked dilation of the esophagus in its upper third, extending down to the level of the angle of Ludwig. The lumen of the esophagus at this point was constricted and irregular, somewhat serrated in outline. The opaque medium passed downward through this constricted portion into a dilated portion below.

Repeating the examination it was discovered that the lower two-thirds of the esophagus was tremendously dilated, more so than was apparent at the first examination. It held at least one quart of liquid and resembled somewhat an undescended or an eventrated stomach. Only a very small quantity of barium passed through the cardiac sphincter, even in the face of huge, deep-cutting hyperperistaltic waves attempting to force the meal onward. Because of the slow emptying of the barium into the stomach the full size and shape of this organ was not disclosed at any time. The barium meal was retained in the lower portion of the esophagus for over twenty-four hours. The upper dilated portion above the constriction emptied out within fifteen minutes.

The films taken after each examination confirmed the fluoroscopic findings. The first impression, not taking into consideration the lower dilated esophageal portion, was that of a constricting malignancy at the level of the tracheal bifurcation. After the second examination, because of the smoothness of the cardiac end of the esophagus, marked dilation, hyperperistalsis, etc., it was concluded that this was undoubtedly a case of cardiospasm, either congenital or acquired, with a constriction at the lower level of the upper third, the precise nature of which was not disclosed but was apparently non-malignant.

At operation the stomach was found to be long and narrow and low in the abdominal cavity. The duodenum was normal. About three inches of the esophagus was below the diaphragm. The hiatus of the esophagus admitted three fingers. The cardia consisted of a markedly thickened ring due to hypertrophied circular muscle. This was resected and removed. A transverse incision was made in the stomach and a sigmoidoscope passed up into the lumen of the esophagus. This met with an obstruction opposite the third intercostal space. The esophagus contained a great deal of yellowish, foul smelling fluid. When this was washed out, the obstruction could be seen as a smooth ring resembling that at the cardia.

The pathologist's report was that of smooth muscle with no other pathological changes and no evidence of malignancy.

This case is unique in that it is evidently one of congenital stenosis of the esophagus in a woman 67 years of age associated with stenosis of the cardia. Either condition in itself is not commonly found in adults: the combination is rarely met with.

CHRONIC MILIARY TUBERCULOSIS AND HEALED MILIARY TUBERCULOSIS

By MORRIS I. BIERMAN, B.Sc., M.D.,
WASHINGTON, D. C.

In the past few years there have been a number of reports of healed miliary tuberculosis and chronic miliary tuberculosis, these two terms being rather loosely applied to the cases under discussion. Some of the authors have assumed the two conditions to be the same, while others appear to have made but slight distinction. The two cases here reported will probably help differentiate these two types of lesions—healed and chronic.

Case 1. (Fig. 1.) C. W., male, white, age 38.

Family history: Father living and well; mother died during childbirth; one brother living and well. No history of tuberculosis, cancer, etc.

Chief complaint: Swelling of arm; smothering feeling in chest; shortness of breath. Has had dyspnea ever since he was gassed in 1918; type of gas unknown. In May, 1919, began to have pain in arm. The blood vessels became hard and very prominent. Now entire arm is swollen from the fingers to the shoulder.

Physical examination: Blood pressure, systolic 136, diastolic 80; pulse 80. Well nourished. Head negative except pyorrhea and dental caries. Chest broad and well formed. Findings negative. Abdomen negative. Genito-urinary tract negative. Extremities, slight clubbing of fingers. Entire left arm somewhat larger than right. Left hand slightly cyanotic. Superficial veins prominent and sclerosed. Glands of left axilla moderately enlarged. Wassermann negative. Urine negative.

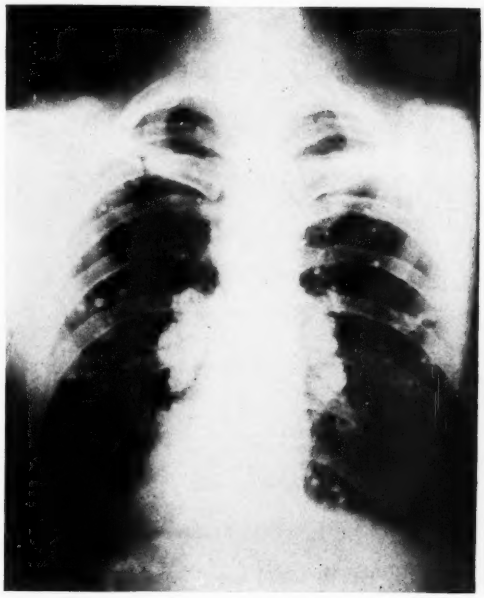

Fig. 1.

Diagnosis: Sclerosis of vessels of left arm; tuberculous lymph nodes of chest; lymphadenitis left axillary glands; no active chest pathology present.

Case 2. (Fig. 2.) T. C. B., male, white, age 42.

Family history: Father killed in accident; mother died at 50 years, cause unknown; one brother and one sister living and well.

Chief complaint: Dyspnea on exertion; headache; cough; pain in cardiac region.

Previous history: Measles; mumps; whooping cough; chickenpox during childhood. Genito-urinary tract negative.

Present illness: In September, 1918, was ill in hospital for about ten days. Some time later again sick for four or five days; had pneumonia or pleurisy. Tonsils and adenoids removed. Now unable to work as farmer on account of weakness.

Physical examination: Negative throughout with exception of double mitral murmurs with slight transmission to axillary line.

In Case 1, there is a history of swelling of the arm extending over a period of at least three years. The swelling of the arm came on gradually, presumably due to the increasing axillary adenopathy. In Case 2,

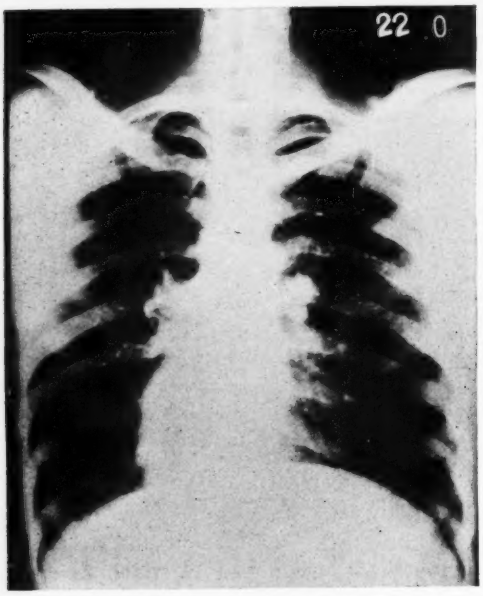

Fig. 2.

there was a slight illness for a few days, but no severe illness of any kind. There is, then, a history covering a period of about three years in the former case, and a history of little or no illness in the latter case.

In Case 1 the calcified tubercles are seen to be of varying sizes and of uneven distribution. Even their calcium content appears to vary with the different tubercles, hardly two tubercles being of the same size. A generalized miliary tuberculosis was not necessary to, and probably would not have produced, this condition. The explanation of this is that the tuberculous masses were deposited in the lung tissue at various times and in varying amounts. The small masses of tuberculous material thrown into the pulmonary circulation were of varying sizes, accounting for the varying sizes of the calcified tubercles, and they were deposited in the lung tissue at different times, accounting for the varying degrees of calcification.

In Case 2, however, all the calcifications were of the same size and uniformly distributed throughout both lungs. They were all apparently deposited in the lung tissue at the same time and uniformly calcified. The factors giving rise to these two conditions appear to be somewhat similar to those found in smallpox and chickenpox. In the former, all the lesions are of the same age and size, while in the latter there are lesions of several ages and sizes, and this difference is sufficient to make the differential diagnosis.

By analogy, irregularly distributed tuberculous calcifications in the lungs, of varying sizes, were produced over an extended period of time. That is to say, the condition is one which is chronic—chronic miliary tuberculosis. Where the calcifications are evenly distributed through the lungs and are of uniform size, they were all probably deposited at the same time, and subsequently calcified and healed—healed miliary tuberculosis. The former condition, then, could correctly be termed chronic miliary tuberculosis, and the latter healed miliary tuberculosis.

EDITORIAL

THE POWER OF SUGGESTION

The subtleties of thought and sophistication of presumptive knowledge are factors that operate in deductive reasoning, and since the practice of medicine is so manifestly deductive, it at once becomes quite apparent that different opinions might be rendered by different persons, which opinions are based upon the same findings.

It is, indeed, a fortunate situation, that roentgenology, by means of the radiogram or the fluoroscope, appeals to that most stable special sense of sight. It is with a feeling of gratification that, in a given case, there is probably more unanimity of opinion among roentgenologists than among most of the other specialists in medicine. Visualized findings are so much more reliable and usually more capable of interpretation than auscultatory, percussive or palpatory findings. Because of this quality, undue enthusiasm on the part of some roentgenologists tends to discredit a valuable aid; also, conclusive reliance should not be placed on the roentgen-ray findings alone.

As medical men, it is our privilege to get such data as anamnesis, clinical findings and laboratory findings to assist us in attaining a more scientific diagnosis. Of course, the findings and determinations should be given in roentgenological terms only, and these findings should be evaluated according to their certitude; if this cannot be done and several disease processes are possible, they might all be mentioned in such rotation as to indicate their probability.

In so doing, the profoundest respect, consideration and credit should be given to the other specialties and to the doctor referring the case. This must constantly be borne in mind to avoid any hostility; due credence should be given where it belongs, and when this is universally practised, co-operation of the specialties rather than competition will be the resultant.

In correlating the roentgen and other findings, it is very *tempting* to make *definite conclusions* on findings other than roentgenological. This practice is to be condemned if used unqualifiedly. It is this very thing that casts a shadow of suspicion on meritorious roentgen work. *This method reads a diagnosis into the plate and fluoroscopic examinations, rather than reading a diagnosis out of the plate and fluoroscopic examinations.*

In other words, it is the border-line or vague case that demands a frank admission of limitation; and it is in just such cases that the roentgenologist will have a surging tendency to make his findings conform to a prior tentative diagnosis. It can readily be seen that if one is justly indecisive, the clinician or surgeon with the most sincere and honest intentions can persuade a roentgenologist to make a decision which is quite arbitrary. In so doing, misleading conclusions are made, and if, in this instance, surgical verification is made, one is credited with a spectacular, although unjustifiable, diagnosis. However, it is more often the case that the operative findings do not support the so-called roentgen findings, thereby discrediting X-ray work in general. It is a peculiar psychological fact that one error more than offsets the value of numerous correct diagnoses. If this is true, would it not be advisable to adopt and use such methods and information as are *definitive*, and if such do not

exist then acknowledge the inability to reach a definite conclusion?

Instead of bluffing, it should be considered better to make negative diagnoses rather than questionable positive ones. The phrase, "I don't know," will avoid many castigations and is used by the really great men or the ignorant, and when used by the former does not cast a blemish on their escutcheon.

It should be the privilege of the roentgenologist to suggest, advise, and expect continued or repeated observation of a patient, as in some cases it may require a lapse of time to produce X-ray manifestations; for instance, osteomyelitis. In other cases, the permanency of an X-ray manifestation may be in doubt; for instance, it may be necessary to decide between a gastric spasm (intrinsic or extrinsic) and a gastric neoplasm. It can readily be seen that this is quite vital.

In conclusion: For the promotion of confidence, let us be sure we are right, then go ahead. If in doubt, say so, and when we don't know, it is no disgrace to acknowledge it.

TENTATIVE PROGRAM, SECTION ON RADIOLOGY, AMERICAN MEDICAL ASSOCIATION

Dallas, Texas, April 19-23, 1926

Wednesday, April 21—

1. Chairman's Address.
2. C. Thurston Holland.....Liverpool, England
3. Ralph Bromer.....Philadelphia, Pa.
   Osteomyelitis: Differential Diagnosis.
4. Amédée Granger.....New Orleans, La.
   New Position for Making Roentgenograph of the Mastoid.
5. Daniel N. Eisendrath and Irvin S. Koll.....Chicago, Ill.
   Renal and Other Retroperitoneal Tumors: Value of Radiography and Supplementary Methods.
6. Bundy Allen.....Iowa City, Iowa
   The Value of the Pyelogram and Cystogram in Abdominal Diagnosis from the Standpoint of the Roentgenologist.
7. Lloyd Bryan.....San Francisco, Calif.
   Gastric Retention of Vegetable Matter.

Thursday, April 22—

8. Willis F. Manges.....Philadelphia, Pa.
   Pathologic Changes in Lung Tissue as the Result of Foreign Bodies of Long Sojourn.
9. L. R. Sante.....St. Louis, Mo.
   Pleural Effusions, General and Local; Their Recognition, Localization and Differential Diagnosis.
10. L. Reynolds.....Detroit, Mich.
    Hemoptysis Due to Non-tuberculous Causes.
11. James T. Case and W. O. Upson.....Battle Creek, Mich.
    The Roentgen Diagnosis of Retroperitoneal Hernia.
12. Sherwood Moore.....St. Louis, Mo.
    Further Observations on Cholecystography.
13. B. H. Orndoff.....Chicago, Ill.
    Roentgenological Study of the Appendix, Cecum and Ascending Colon.

Friday, April 23—

14. Frank E. Simpson and Roy E. Flesher.....Chicago, Ill.
    Radium Emanation as a Palliative Agent in the Treatment of Intraoral Cancer.
15. Curtis F. Burnam.....Baltimore, Md.
    Hodgkin's Disease and Lymphosarcoma, with Special Reference to their Treatment by Radiation.
16. W. S. Lawrence.....Memphis, Tenn.
    Surgical Diathermy as an Aid to Radiotherapy in the Treatment of Malignancy, with Special Reference to Malignancy within the Mouth.
17. Henry Schmitz and Joseph F. E. Laibe.....Chicago, Ill.
    The Treatment of Inoperable Carcinomata of the Urinary Bladder with X-rays.
18. James A. Corscaden.....New York, N. Y.
    The Psychoneuroses of the Artificial Menopause.
19. Ethel D. Humphreys, Sanford Withers and John R. Ranson.....Denver, Colo.
    Shortening the Quarantine Period for Diphtheria Convalescents and Carriers.
20. E. C. Samuel and E. R. Bowie. New Orleans, La.
    Roentgen Therapy of Exudative Iritis.
21. William S. Stone.....New York, N. Y.
    A Clinical Study of Leukemia, as Observed under Radiation Therapy.

ARTHUR C. CHRISTIE, *Chairman*;
HARRY M. IMBODEN, *Vice-chairman*;
M. J. HUBENY, *Secretary*.

MEDICAL RADIOLOGY AND ELECTROLOGY [1]

THE CAMBRIDGE DIPLOMA

A Diploma in Medical Radiology and Electrology is granted by the University of Cambridge. The primary object is to provide adequate training in a branch of medical work which is becoming increas-

[1] Reprinted from the *British Medical Journal*, Sept. 5, 1925, p. 453.

MANLY J. SANDBORN

President of the Radiological Society of North America

ingly important and difficult, and which is outside the ordinary medical curriculum. The diploma is open only to those who hold a medical qualification, and includes a course of lectures and practical work in physics (Part I) and in radiology and electrology (Part II). Attendance at the necessary courses of lectures in both subjects, and, in addition, six months' clinical experience in an adequately equipped hospital recognized by the Diploma Committee, are essential. The whole course of study takes six months, the lectures, practical work, and hospital attendance running concurrently.

The courses carried out by the University of Cambridge are at present arranged to begin early in January. Three months are spent at Cambridge doing the lectures and practical work in Part I, and attending the systematic lectures in Part II and the practice of Addenbrooke's Hospital, where there is a fully equipped and up-to-date X-ray and electrological department. The remaining three months can be completed at any hospital recognized by the Diploma Committee for this purpose (a list of such hospitals can be obtained), but special arrangements are made for students to continue their studies in London, where demonstrations at various hospitals are arranged, in order to give a wide experience.

In addition, an independent course is arranged by the British Institute of Radiology. This course is held entirely in London, but is recognized by the University as qualifying for the examination; it begins early in October.

Further particulars as to the Cambridge courses can be obtained from F. Shillington Scales, M.A., M.D., Medical Schools, Cambridge, and of the London courses from Stanley Melville, M.D., at the offices of the British Institute of Radiology, 32, Welbeck Street, London, W. 1.

ANNOUNCEMENT

The Tenth Annual Congress on Internal Medicine will be held at Detroit and Ann Arbor, week of February 22-27, 1926.

The Congress is devoted to amphitheatre, bedside and clinical laboratory demonstrations as well as to symposia dealing with modern phases of internal medicine. Distinguished guests from abroad, Canada and the leading clinics of the United States will occupy prominent places on the program. Four days will be devoted to the work at Detroit, and on one day the Society will be the guest of the University of Michigan at the newly opened eleven-hundred-bed University Hospital.

All physicians who are interested in internal medicine and who are members in good standing of their local and national societies are cordially invited to attend the Congress.

Hotel headquarters will be at the Book-Cadillac in Detroit. Information regarding reduced railroad rates, program, hotel accommodations, etc., may be secured from the Secretary-General.

C. G. JENNINGS, M.D., *President*,
American Congress on Internal Medicine, Detroit, Mich.

FRANK SMITHIES, M.D., *Sec'y-Gen'l*,
920 N. Michigan Avenue,
Chicago, Ill.

AWARD OF GOLD MEDAL

Doctor Evarts A. Graham, of St. Louis, Missouri, was awarded a gold medal at the recent meeting of the Society, for meritorious and original work on cholecystography.

In true scientific style he mentioned the names of Dr. Warren H. Cole, Dr. Glover H. Copher, and Dr. Sherwood Moore as co-sharers of any credit and glory. He expressed himself as sincerely grateful and appreciative for their assistance, which made this work possible.

COMMUNICATION

In the *Journal of the American Medical Association* of December 5, 1925, appears a report by Dr. Martland, Dr. Conlon and Dr. Kneff, of Newark, N. J., on "Some Unrecognized Dangers in the Use and Handling of Radio-active Substances." This report relates particularly to the storage of insoluble products of radium and mesothorium in the reticulo-endothelial system. All radiologists should read this report, which is very detailed and very complete. The study covered by it was carried out in the most thorough fashion and the conclusions are unescapable.

While these conclusions are based on the dangers of handling radio-active substances under the conditions obtaining in certain factories where these products are used to give luminosity to the figures on watches, clocks, etc., it is but natural to assume that any solution of radium element or of other insoluble radio-active substances ingested by mouth or injected intravenously, would, other things being equal, be disposed of in the same manner and lead to similar results if taken in corresponding quantities.

From time to time the use of radium solution by intravenous injection has been advocated in the treatment of leukemia. This report will probably lead the proponents of such a method to reconsider the entire question.

A. U. DESJARDINS, M.D.

CALIFORNIA'S PREDICAMENT

A COMMUNICATION

I am enclosing herewith a copy of an X-ray report, brought in by a patient who had had a gastro-intestinal examination made by one of the numerous chiropractic X-ray specialists in the State of California. The "specialist's" fees were the same for the examination as those made by a reputable roentgenologist.

Fortunately the patient brought along the "specialist's" films, so that we could study them and compare them with his report. The "so-called ulcer" which the "specialist" had marked on one of his films with an arrow, was simply barium present in the lower end of the esophagus, and the "*niches*" observed near the pylorus were *peristaltic waves.*

The contour of the colon seemed fairly normal, with no dilatation, although the films were so badly over-exposed that in places the shadow of the colon was completely burned out.

Our examination showed the heart to be normal in size and contour, with no demonstrable evidence of "mitral stenosis" or "mild aortic stenosis." Furthermore, there was no evidence of pathology in any part of the gastro-intestinal tract.

Apparently a little knowledge is a dangerous thing, especially in the hands of the unscrupulous.

COPY OF THE CHIROPRACTIC REPORT

Patient:
Doctor:
Examination: Gastro-intestinal Tract.

Fluoroscopic examination of the chest reveals mitral stenosis, hypertrophy of muscle, and mild aortic stenosis.

The stomach lies about four inches below umbilicus, is normal in size and fish hook in form, with a large hour glass contraction, denoting large saddle ulcer on the lesser curvature. The ulcer is active, but has not reached the obstructive stage as yet. The tone of the stomach is poor; there is much gas present and there are several niches near the pylorus, causing a marked obstruction to the free passage of the meal through the pylorus.

The duodenum was also slightly obstructed and the bulb of the duodenum was deformed and small in size. The jejunum and the ileum were dilated, probably due to prolapsus and stricture of the cecum. The ileo-cecal valve was competent, and the appendix were not seen.

The colon, from the cecum to the descending colon inclusive, were prolapsed down-

ward. The cecum was down in the pelvis and there was a stricture on its upper end. The ascending and transverse colon were also markedly prolapsed, also dilated and atonic, with slow peristalsis. The hepatic flexure was curled upon itself.

The meal head reached the hepatic flexure in six hours, and a small amount reached the rectum in twenty-four hours. At the fifty-three-hour examination a large residue was remaining in the cecum, ascending colon, hepatic flexure, transverse colon, and rectum.

Diagnosis:

Gastroptosis, with atony.

Saddle ulcer, active, lesser curvature of stomach.

Deformed duodenal cap. Severe enteroptosis.

Intestinal stasis with resultant autointoxication.

Respectfully submitted,

(Sgd.) Dr. ————,

Chiropractic X-ray Specialist.

BOOK REVIEWS

La Physique des Rayons X (A L'Usage des Medecins). By Loisel and Lomon. Publishers: Masson and Co., Paris, 1925. Paper., pp. 150. Preface by Professor André Broca.

The object of this little book is to explain briefly the fundamental physics of radiology, and, on reading it, one cannot help admiring the ability of the authors, in a few words, to make clear the different questions touched upon; such as, the concept of ionization, discharge in rarefied gases, the electron, the production of X-rays, the nature and properties of X-rays, the emission of X-rays and their absorption, as well as secondary and corpuscular radiation.

A separate section at the end of the book is devoted to the explanation of the different varieties of X-ray tubes.

The only criticism that can be offered is that the book is, perhaps, a little too brief. However, it can be read with profit—not only by beginners in radiology, but also by more advanced workers who may wish to clarify their notions of the fundamental principles underlying such work.

A. U. Desjardins, M.D.

Landmarks and Surface Markings of the Human Body. By L. Bathe Rawlings, M.D., B.C. (Cant.), F.R.C.S., Surgeon to St. Bartholomew's Hospital. With thirty-six illustrations. Sixth edition. Paul B. Hoeber, Inc., 67 and 69 East 59th Street, New York, 1925. Price $3.00.

This English monograph is presented by an American publisher at last. It has enjoyed five previous editions. This sixth and elaborated edition offers new colored plates of interest. It is really a topographical anatomy with a concise text. Marginal captions link the text with the excellent colored sketches in a practical fashion.

This book should be a handy reference volume for the radiographic department. The appendix carries a summary of epiphyseal age developments and other items of frequent forgetfulness.

Industrial surgery also makes demand for such a speedy reference book.

E. H. Skinner, M.D.

An X-ray Atlas of the Normal and Abnormal Structures of the Body. By Archibald M'Kendrick, F.R.C.S. (Edin.), D.P.H., F.R.S.E., Surgeon-in-Charge of the Surgical X-ray Department, Royal Infirmary, Edinburgh; Examiner, Royal College of Surgeons, Edinburgh, and Charles R. Whittaker, F.R.C.S. (Edin.), F.R.S.E., Assistant Lecturer on Anatomy, Surgeons' Hall, Edinburgh; Examiner, Royal College of Surgeons, Edinburgh. Edinburgh, E. & S. Livingstone, 16 and 17 Teviot Place, 1925. Price $10.00.

This modern atlas succeeds in providing a series of radiograms illustrating the nor-

mal and abnormal structures of the body and the more common injuries. Some rare lesions are included. The different appearances of the various joints with the alteration of the focus point is a problem that the authors have generously depicted.

The total number of plates is 194, carrying 388 illustrations. They are of excellent radiographic and lithographic quality. There are also some 25 diagrams within the brief text, upon the pages opposite the plates.

The authors have given careful thought to seek reliable sources for specimens of bone tumors, etc. The Royal College of Surgeons of Edinburgh furnishes several and many well known English radiologists have contributed radiograms of proven cases.

Inspection of the book reveals an especially interesting array of reproductions of pathologic hips and jaws, but there is a uniform excellence to the whole book.

We recommend this atlas to that great group of possessors of X-ray apparatus who can make good roentgenograms and then wonder what they mean.

E. H. SKINNER, M.D.

ABSTRACTS OF CURRENT LITERATURE

INDEX TO ABSTRACTS IN THIS ISSUE

Roentgenologic teaching. — Roentgenology as a modern specialty is inadequately taught in a large percentage of the medical colleges in the United States. It should be recognized as a separate department in all standard medical schools and should have a director of professorial rank. Its teaching in our medical colleges should be carefully correlated with the other branches, so that the students would receive proportionate and adequate instruction in this specialty.

The Class A hospital should assist in the teaching of roentgenology by affording its interns the opportunity to become acquainted with the everyday applications of its principles.

The training of the specialist in roentgenology should be one of the functions of a Class A hospital.

W. W. WASSON, M.D.

Education in Roentgenology. Preston M. Hickey. Jour. Am. Med. Assn., Aug. 22, 1925, p. 557.

Hodgkin's disease.—The author records his observations on twelve cases of Hodgkin's disease treated by X-rays; six were males and six females. The youngest was aged 16 and the oldest 58, the majority being between 16 and 30. The duration of the treatment varied considerably. Most had two courses of treatment with an interval of two months or more between the courses. In some cases the tumors disappeared very rapidly, and in others more gradually. Two cases were excluded from further consideration, as the treatment was insufficient. Four made a complete recovery, while the remaining six all showed an initial improvement, but soon had a recurrence which ended fatally. As regards the detailed effects of treatment the results were as follows: The lymphomata disappeared very rapidly under treatment, though not so rapidly as sarcoma or leukemic tumors. On microscopic examination the cells of the glands which had been irradiated showed a disappearance or degeneration of all the abnormal cells and their replacement by granulation tissue, which was converted finally into hyaline connective tissue. The fever usually increased after irradiation, sometimes reaching a very high level, but rapidly fell, especially after a large dose of the rays. The treatment had no direct effect on the red corpuscles, but had a decided influence on the white cells, as was shown by a rapid diminution of the lymphocytes and polymorphonuclears, and a transient or lasting leukopenia, according to the dosage of the rays. The effect of treatment on the spleen was that the organ first became much larger and then much smaller. In conclusion, Steenhuis states that the treatment should be very vigorous, and that the whole trunk should be irradiated.

X-ray Treatment of Hodgkin's Disease. D. J. Steenhuis. Nederl. Tijdschr. v. Geneesk., March 28, 1925, p. 1398. (Reprinted by permission from the Brit. Med. Jour., Aug. 22, 1925, p. 24 of Epitome of Current Medical Literature.)

The prostate and low back pain.—In this article the author has excluded tuberculosis of the spine and genito-urinary tract, lues, malignancy, organic nervous diseases, and fractures of the spine or joints under discussion. A questionnaire to the orthopedic surgeons of the State brought replies from sixteen. Nine of these did not have records, but all admitted that they found X-ray pathology in the lumbo-sacral and sacro-iliac joints in patients complaining of pain in the back associated with prostatitis. The other seven give definite percentages, with an average of 28 per cent, and also gave 32 per cent as the average of patients complaining of low back pain in whom they found prostatitis. In some reports the figures ran from 50 to 75 per cent. These percentages are remarkable when we take into consideration the fact, following the researches of Rosenow, that the selective action of the various types of streptococci emanating from various foci of infection may have a predilection for the tendon sheaths, muscles and joints, which very often do not show any definite lesions on the X-ray film. Thus, there may exist definite involvement of these tissues without demonstrable lesions. The diagnosis should be based on a thorough general examination, including the whole of the urinary tract, with the pyelogram to discover any abnormality, and source of infection.

F. B. SHELDON, M.D.

The Prostate and its Influence on Low Back Pain. Lionel P. Player. Calif. and West. Med., Aug., 1925, p. 993.

Lipiodol in lung diagnosis. — During the last two or three years another epoch-making aid in the diagnosis of lung conditions has been the introduction of lipiodol in radiology. This is a pharmaceutical product originated by the French and first used by Sicard and Forestier, in 1922, for localization of tumors in the spinal canal. Sergent and Cottenot, in 1923, first studied dilatations of the bronchi and bronchiectasis in adults by intratracheal injections of lipiodol through the cricothyroid membrane, and Armand-

Delille and his co-workers applied the same method in children.

The technic of injecting through the cricothyroid membrane is open to many objections. The author considers this method unjustifiable in adults when a bronchoscopist is available. He gives an account of his own method and experience during the last three years in the use of lipiodol in the Otolaryngological Department of the Royal Victoria Hospital, Montreal. The radiologic work was done by Dr. Pirie and Dr. Brooks of that hospital.

The bronchoscopic technic is thus described. Patients are usually examined early in the morning on an empty stomach. A preliminary hypodermic injection of morphine or pantopon with atropin is given half an hour before the application of the local anesthetic. The larynx is thoroughly anesthetized with a solution of cocain 20 per cent one part, and adrenalin 1/1000 two parts. The patient is then placed on the X-ray table on which he is to be radiographed. A direct examination of larynx, trachea, and bronchi is made. When the vocal cords are passed, the trachea and bronchi are sprayed with the above anesthetic solution to abolish the cough reflex. Any pus or secretion is aspirated, and then 10 to 30 c.c. of the "warmed" lipiodol is injected into one or both lungs with a long Luken's bronchoscopic syringe. The bronchoscope is then withdrawn and radiographs are taken in various positions—stereoscopic, anteroposterior, lateral right and left, and with head lowered about 45° for about ten minutes, to study the effect of gravity; also in the sitting position.

The patients suffer little, if any, pain at the time of injection and there are scarcely any after-effects.

The conclusions reached by the author as to the value of this method are stated as follows:

The X-ray diagnosis of broncho-pulmonary conditions by means of lipiodol injections is of great value by virtue of the marked contrasts obtained. It opens up a new field in the study of normal and pathological bronchi. Pathological changes can be seen at a glance. Positive diagnosis of bronchiectasis has been made possible.

It bids fair to become also a valuable aid to the thoracic surgeon, and it is hoped that it will permit of the early localization of lung abscesses. It will probably assist the surgeon materially in the selection of suitable cases for operation in pulmonary tuberculosis.

It will aid in the diagnosis of subdiaphragmatic abscess, interlobar empyema communicating with a bronchus, newgrowth and other similar conditions.

Lipiodol is eliminated from the lungs either by coughing or by absorption from the alveoli; it has been reported to remain in the lung as long as two months.

The author furnishes a number of very striking radiograph reproductions, illustrating normal lungs, lung abscess, and bronchiectasis, and indicating the great value of this method of diagnosis in such conditions.

L. J. CARTER, M.D.

The Injection of Lipiodol as an Aid in the X-ray Diagnosis of Broncho-pulmonary Lesions Including Tuberculosis: Preliminary Report. David H. Ballon. Canadian Med. Assn. Jour., Oct., 1925, p. 995.

Lipiodol in pulmonary tuberculosis.—Dr. Archibald, Surgeon-in-chief, Royal Victoria Hospital, Montreal, reports three cases in which, at his request, Dr. Ballon injected lipiodol, to demonstrate cavities and bronchiectasis in tuberculous lungs. These three patients had undergone, two or three years previously, the operation of total posterior thoracoplasty. After a period of comparative relief following the operation each had developed again the former symptoms of cough and sputum. But now, as a result of operative procedure, the new bone, and pleural thickening, gave so dense a shadow as to obscure all detail in the ordinary radiograph. Under these circumstances the injection of lipiodol afforded information that was both new and necessary.

In the first case, a lower lobe, which had not received, at the time of operation, as much compression as the upper, was shown to be the site of a new invasion of tuberculous disease.

In the second and third cases, cavities were seen newly developed in lung tissue compressed at the time of operation.

This localization of residual lesions after thoracoplasty is hardly possible by any other method. It also allows one to determine whether a further operation is justifiable or not. One looks forward to its use in differentiating between localized pneumothorax and intrapulmonary cavity, a distinction which is frequently difficult to make. The problem of annular shadows may, in some measure, be resolved by this method.

Radiographic reproductions are printed, showing the conglomeration of dilated bronchi and bronchioles in Case 1, and the cavities in Cases 2 and 3.

L. J. CARTER, M.D.

X-ray Demonstration of Pulmonary Changes in Tuberculosis by Lipiodol Injection. Edward Archibald. Canadian Med. Assn. Jour., Oct., 1925, p. 1000.

Experimental intestinal obstruction.—Experimental duodenal obstruction is associated with alkalosis, tetany and death, as noted by previous workers.

Continuous adequate and thorough drainage of obstructed intestinal loops can best be carried out by the use of two tubes.

Such irrigation of the obstructed duodenojejunal loop has a favorable action, and when accompanied by control of alkalosis relieves the symptoms and prevents death.

W. W. WASSON, M.D.

Experimental High Intestinal Obstruction: Relief by Irrigation and Control of Alkalosis —Preliminary Report. Milton M. Portis and Bernard Portis. Jour. Am. Med. Assn., Aug. 22, 1925, p. 574.

X-ray sickness. — The writer discusses the prevention of the vomiting following irradiation of the abdomen, which is most severe after X-ray treatment on the stomach, liver, uterus, or ovaries, and is regarded by some as an unavoidable sequel. It is most frequently met with after intensive treatments where the whole series of exposures is completed in one day. The cause of the hyperemesis has been attributed to ozone and to nitrous acid, and the use of high, well ventilated rooms helps in its prevention. Zweifel has obtained good results in treatment from the administration of 200 c.c. of salt solution either as an enema or subcutaneously. He adds that sickness can be prevented by encasing the tubes in lead boxes constructed to prevent the escape of all rays except those directed onto the lesion, after first passing through a zinc or copper filter. During an experience over eighteen months of two hundred such treatments of from four to six hours or more for fibroids or cancer, and for tumors of the liver and cancer of the stomach, no case of sickness occurred. He concludes that avoidance of vomiting is important in all cases, but that it is especially so in cancer, as it enables the patient more quickly to recover from the strain of the treatment.

Prevention of X-ray Sickness. E. H. Zweifel. Brit. Jour. Radiol., July, 1925, p. 267. (Reprinted by permission from Brit. Med. Jour., Aug. 22, 1925, p. 24 of Epitome of Current Medical Literature.)

Early carcinoma of the uterus.—The author's conclusions are based on the careful summing up and weighing of the opinions advanced by different writers, who from their experience and the clinical material at hand may speak with conviction. He feels, therefore, that the opinion presented represents the consensus of the current opinion of surgeons and gynecologists. Speaking generally, it seems from the vast detail of therapeutic measures that have been utilized from time to time, two procedures stand out as most rational, namely, radical operation and radium and deep X-ray therapy.

Treatment of early carcinoma of the uterus implies an early diagnosis and for this we must depend more on our visual and tactile senses, aided by a carefully taken history and study of the symptoms, in arriving at a working diagnosis which will permit prompt and efficient treatment.

In the cervix there are two main types, the squamous cell and the adenocarcinoma, and in the body of the uterus it is usually of the latter type. The spread is by continuity, the lymphatic system direct, or as secondary nodules or emboli, and by the blood stream. Involvement of the pelvic connective tissue occurs early in the form of discrete nodules, 75 per cent of the operative cases presenting this complication. The frequency of gland involvement is very inconstant. In one series, 28 per cent of the women dying from cancer showed no gland involvement; 33 per cent of the cases operated on showed carcinoma of the glands, and 33 per cent had enlarged glands but the involvement was inflammatory, with no carcinomatous glands present.

The author believes that the treatment of early carcinoma of the cervix should be by radical operation, where no contra-indicating factors exist; the percentage of operability being from 40 to 60 per cent, depending on the stage of the disease when seen and the skill of the operator. Operability means curability and implies early diagnosis. The proportion of surgical cures, *i.e.*, freedom from recurrence after five years, varies from 40 to 50 per cent plus, and the absolute curability of cervical cancer, derived from a study of the total number of cases, varies from 16 to 25 per cent. These percentages are gradually being increased by improvement in the technic and surgical judgment, by early diagnosis, and by the judicious use of X-rays and radium as post-operative measures.

Glands are involved in 30 to 50 per cent of the operable or early cases. Limited surgery is useless.

The field for radium is indeed broad, including inoperable and borderline cases, but its real field in the early cases is not sufficiently tried to warrant throwing aside surgery in early and operable cases. We have statistics from thousands of patients treated by radical operation in the last twenty years, but radium intelligently applied is too recent to permit similar state-

ments from sufficiently large series for comparison. We do not know what the years may bring forth in these radiated cases. In the borderline cases, surgery offers only a 10 to 15 per cent chance of cure and radium is, therefore, the treatment of choice, Bumm showing 23 per cent of five-year cures, 39 per cent of three-to-four-year cures. Perhaps in time, with improved radium technic, this may replace surgery in the early cases.

As a post-operative measure, where there is reasonable doubt that all of the diseased tissue has been removed, radium or deep X-ray therapy should be used as soon as the tissues have healed.

F. B. SHELDON, M.D.

The Treatment of Early Carcinoma of the Uterus. J. W. Sherrick. Calif. and West. Med., Aug., 1925, p. 1002.

Cancer of the lower lip. — Dr. McGuffin chooses this topic for discussion because of the great frequency of cancer of the lower lip occurring in his practice as compared with malignancies in other locations. As a result of wide experience in treating this class of cases his line of treatment has taken on a definite procedure.

Classifying cancers of the lower lip into the superficial papillary, deeply infiltrating, and glandular, he adopts a uniform line of treatment for each class. He considers the custom of previously removing a section for biopsy as a dangerous procedure.

In Class 1,—the superficial papillary type,—he prefers radium. The affected area is mapped out and a 10 mg. plaque radium element, half strength, filtered by 0.2 mm. Al., 1 mm. gauze, and one layer of rubber dam, is placed so as to include the affected area and one-half inch beyond. An exposure of three hours is given. A second exposure of six hours is then given (using the same amount of radium, but increasing the filter by the addition of 0.3 mm. brass). There will be a definite sharp reaction during the third or fourth week. Healing will be completed in from six to eight weeks.

In Class 2,—the deeply infiltrating type,—radium and X-rays are used, followed by surgery, and finally by radium and X-rays. Deep X-ray therapy is applied over the glandular areas, *viz.*, each side of the neck and the posterior mediastinum. The following factors are used: 150 K.V. (sphere gap), 6 ma., 13 portal, 50 cm. S.T. distance, ¼ mm. copper, 1 mm. Al., 45 minutes to each area (distributed over nine days, five minutes each day). Radium is applied locally, 50 mg. to outside of lip for 15 hours, and 50 mg. to inner side of lip for 9 hours.

Surgical treatment now follows, in two stages: first, a resection of the cervical lymphatics, which can be done while the affected area is recovering from the radium; second, a resection of the affected area, after the radium reaction is completed. Post-operative deep X-ray therapy is used as soon as the wounds have healed.

Class 3,—the type in which there is glandular involvement,—is a strictly radium and X-ray case. All that can be hoped for here is to relieve the pain, slow up the malignancy, and improve the morale of the patient.

The radium and X-ray technic is similar to that used in Class 2 with the exception that heavier doses of X-ray are used. The voltage is increased to 200 K.V., the filtration to ½ mm. copper, and the time to 75 minutes to each side of the neck, and 90 minutes to the posterior mediastinum.

Supporting treatment is very important, such as local cleanliness, the relief of pain, the stimulation of the appetite, the correction of constipation, and the counteracting of anemia. Diet is important. Foods rich in cholesterol should be eliminated, *viz.*, fresh milk, cream, cheese, butter and meat fats, eggs, fish and cod liver oil. The diet should consist of nuts, buttermilk, olive oil, lean meat, fresh fruits and vegetables, brown bread, honey and water. Ultra-violet therapy, or direct sunlight, according to the Rollier method, will be great aids to general metabolism.

L. J. CARTER, M.D.

Cancer of the Lower Lip. W. H. McGuffin. Canadian Med. Assn. Jour., Oct., 1925, p. 1046.

Tuberculosis of knee joint. — This study gives evidence that the methods of diagnosis used in these cases, although they were those practised universally at the time, are wholly untrustworthy. We know of no method of making a diagnosis in knee joint tuberculosis except by aspiration, with guinea-pig inoculation, or by exploratory operation with tissue examination and guinea-pig inoculation.

Without a positive means of diagnosis, we are subjecting patients who do not have the disease to long periods of treatment, having our suspicions confirmed by the bone and muscle atrophy that appears as a result of the treatment. Subjecting the joints, especially of growing children, to long periods of immobilization in many instances does permanent damage.

Is it not more scientific, as well as more humane, first to make a positive diagnosis, when this is possible,—and in most instances it is,—before we institute any method of treatment?

Whether any case of tuberculosis of the knee joint may be definitely cured with mobility, is doubtful. Surely such would be possible only in a case in which the diagnosis was made very

early. We are forced to the conclusion, from this series at least, that the conservative methods here used have failed to accomplish a cure in all but three cases that were fused by Nature. The other cured cases, sixteen, were fused by operation. The elimination of motion by fusing the knee by operation offers the only means we know of curing the disease, and it should be done early in the disease, and may be done as early as the sixth year without any disturbance of the growth of the leg.

W. W. WASSON, M.D.

End-results in Treatment of Knee Joint Tuberculosis. Russell A. Hibbs and Herman L. von Lackum. Jour. Am. Med. Assn., Oct. 24, 1925, p. 1289.

Radiography in diagnosis of diaphragmatic hernia.—The writer reports on the study of 378 cases of diaphragmatic hernia in which operations were performed. In about two-thirds of the civilian patients in whom the etiology was established the hernias were due to penetrating wounds or to rupture of the diaphragm by sudden increase in the abdominal pressure. In a large number of cases the diagnosis was unsuspected until the operation, though the symptoms had been present for many years. Hedblom suggests that a history of a penetrating wound of the lower thorax, of crushing, of collision, or of a fall, should give rise to the suspicion of diaphragmatic hernia in cases in which the diagnosis is doubtful. For differential diagnosis he recommends radiography of the thorax after administration of an opaque substance in a meal, though this examination may fail if there is a spontaneous temporary resuction, or a failure of the opaque substance to enter the extruded portion. An exploratory operation is recommended after a positive diagnosis, even if the symptoms are slight, since very often obstruction develops; this complication more than doubles the post-operative mortality, and limits the possibility of rupture of the hernia, necessitating secondary operations. Exploratory laparotomy is preferable if the cause of the obstruction is doubtful or has been shown to be parasternal.

In cases due to a recent wound, with prolapse of omentum through the hernia, thoracotomy provides the most direct approach, and may be combined with a transdiaphragmatic exploration for injury to the abdominal viscera. In ordinary cases thoracotomy has yielded a somewhat lower mortality than laparotomy and a larger proportion of successful closures. In more than 90 per cent of the patients operated upon no sac was present, thus obviating the objection that thoracotomy carries the risk of the development of an operative pneumothorax. Hedblom recommends the suture of the hernial ring, if possible, since covering the hernial opening with an abdominal viscus has frequently resulted in recurrence of the hernia. A few large or recurrent hernial openings have been successfully closed by fascial or muscle transplants.

After the operation, whether by thoracotomy or laparotomy, the air should be aspirated from the pleural cavity after this has been closed.

Recurrences following rupture of diaphragmatic hernias were reported in about 5 per cent of the cases. The operative mortality was mainly due to the lateness of the operation in the presence of obstruction, to shock, and to respiratory failure.

Diaphragmatic Hernia. C. A. Hedblom. Jour. Am. Med. Assn., Sept. 26, 1925, p. 947. (Reprinted by permission from Brit. Med. Jour., Oct. 24, 1925, p. 58 of Epitome of Current Medical Literature.)

The progress of radiology.—To the general practitioner the expansion of radiology into its highly specialized state has been a little disconcerting in its rapidity; not only so, but there has been so far comparatively little done to bring the subject under survey as a whole for those who, leaning confidently as they do on the guidance of X-rays, are still desirous of occasionally taking stock of their own impressions and knowledge. Such a stock-taking took place in connection with the organization of the first International Congress of Radiology in London, when five hundred radiologists presented a hundred and fifty papers—an authoritative exposition of the place of radiology in the medical world.

From a brief summary of the outstanding features of the Congress, the *Canadian Medical Association Journal*, in an editorial way, places before the Canadian medical profession a concise synopsis of the achievements radiology has contributed in the short period of thirty years which has elapsed since Roentgen's discovery.

Allusion is made to the terrific cost in life and physical injury, at which the pioneers of radiology handed down the discoveries of early days —discoveries which the modern worker may now use in comparative security.

Sir Berkeley Moynihan's address before the Congress is referred to, in which he pointed out that a parallel might be drawn between the great advance in surgery wrought by the work of Lister, and the magnitude of the assistance now given to the surgeon by the X-ray.

Sir Berkeley pointed out particularly the value

of X-ray in abdominal conditions, where, in many cases, the diagnosis depends on the X-ray alone. In gastric disease, he pointed out, we owe almost everything to the radiologist. The obscurities surrounding the diagnosis of gastric ulcer have been completely dispelled by radiology.

In cancer of the stomach, Sir Berkeley said, the radiologist is now our strength. He is able to make the diagnosis long before we could in the least degree be confident, by any other means at our command. The radiologist is also of assistance in the diagnosis of the gall bladder, and still more so owing to the recently developed method of examination introduced by Graham.

In the matter of X-ray therapy, the picture is a little less bright. Yet acknowledgment is made of the fact that the radiological department receives such a large proportion of cases for which the surgeon can do nothing, as well as of those for which he has done all he can. "All the surgical outcasts find refuge in the X-ray therapy department . . . yet something is wrought upon these cases that at times approaches the miraculous."

Sir Berkeley concluded by saying: "When we consider that this science is a newcomer into the fields of diagnosis, of therapy, and of research, the results obtained in so short a time are surely matters for which humanity at large may feel profoundly thankful."

L. J. CARTER, M.D.

The Progress of Radiology, Editorial in Canadian Med. Assn. Jour., Oct., 1925, p. 1062.

Tetanus toxin exposed to radium emanation. — The authors exposed tetanus toxin to the various emanations from radium, and estimated the dose of each of these that was necessary to destroy its toxicity. The particular toxin used was one containing 10,000 minimal lethal doses for a mouse of 15 to 20 grams. The toxin was submitted to the action of the rays, then diluted a thousand times, and 1 c.c. of this dilution—that is, 10 M. L. D.—was injected into one of the hind feet of a mouse. A control mouse was injected with the same dilution of a non-irradiated toxin. Having determined that the toxin could be destroyed by radium, they examined the action of each of the different emanations—alpha, beta, and gamma. The total amount of radiated energy was measured by the quantity of emanation destroyed during its action on the toxin, and was expressed in millicuries or in microcuries.

First the action of the beta and gamma rays together was studied. It was found that to alter the toxin so that a 1 in 1,000 dilution was no longer fatal to a mouse, 0.9 millicurie was required for an exposure of twenty-four hours, or 0.6 to 0.7 millicurie for an exposure of forty-eight hours. The gamma rays acting alone were successful in a dose of 9 millicuries after forty-eight hours. The alpha rays acting practically alone were successful in a dose of 15 microcuries after forty-eight hours. Further work showed that the longer the time during which it was allowed to act the less was the dose of emanation required. Thus to destroy the toxin at 1 in 1,000 required 0.9 millicurie when beta and gamma rays were acting together; to destroy the toxin at 1 in 500 more than 1 millicurie was required; and for the mere attenuation of the pure toxin 9 millicuries were required.

In another paper in the same issue (p. 611), S. Mutermilch and R. Ferroux state that they found it impossible to destroy the toxic group without simultaneously destroying the antigenic group of tetanus toxin. Radium would therefore seem to differ from the majority of physical and chemical agents, which usually act first by destroying the toxic group and leaving the antigenic group intact.

Action of Radium Emanation on Tetanus Toxin. R. Ferroux and S. Mutermilch. C. R. Soc. de Biologie, Aug. 14, 1925, p. 608. (Reprinted by permission from Brit. Med. Jour., Oct. 24, 1925, p. 62 of Epitome of Current Medical Literature.)

Experimental gastric ulcers.—Acute ulcers of the stomach have been produced in dogs and rabbits on the basis of local anaphylaxis to foreign proteins.

W. W. WASSON, M.D.

Studies on Gastric Ulcer. III. The Experimental Production of Gastric Ulcer by Local Allergy: Preliminary Report. A. C. Ivy and P. F. Shapiro. Jour. Am. Med. Assn., Oct. 10, 1925, p. 1131.

Healing of arteries. — In five cases cited there was re-establishment of the arterial lumen following ligation in continuity of a large artery. Eighty single and multiple ligations of brachial, femoral and carotid arteries of dogs with and without section of the artery were done and specimens collected at various intervals from a few hours to seven months after operation. Four of fifty-two ligations in continuity and none of twenty-eight ligations with section were followed by a partial re-establishment of the arterial channel.

In multiple ligations with section of the artery the ends retract, and the intima of each

stump is exposed to the surrounding raw tissue, securing an additional amount of nutrition and forming a firm, permanent, cicatricial plug.

The results of these studies indicate that, in order to insure a permanent occlusion of a large arterial channel, the best method of ligation is to apply two or more ligatures and to sever the artery between the ligatures, allowing the ends of the artery to retract. In large vessels it is better to apply three ligatures and to divide the artery between the two distal ligatures. By this procedure the proximal ligature takes up the impulse of the heart beat and permits the tissue within the grasp of the distal ligature to heal at rest.

W. W. WASSON, M.D.

The Healing of Arteries after Different Methods of Ligation. J. S. Horsley, Jr. Jour. Am. Med. Assn., Oct. 17, 1925, p. 1208.

Secondary hypertrophic osteoarthropathy.—Dr. Bryan reports that the majority of authors are agreed that this condition is caused by a long-continued hyperemia secondary to an intrathoracic condition, in addition to the toxemia of the primary disease. While the primary disease is usually a chronic one, it may be an acute condition.

The course of the disease is a variable one. It may subside and entirely disappear, with the healing of the primary lesion. Clinically the condition is characterized by soft tissue tenderness, swelling, redness and pain in the region of the joints. Roentgenologically the first findings are a bur-like irregularity of the distal phalanges, later a laminated periostitis involving, first, the fifth metatarsal and metacarpals, then the remaining metatarsals and metacarpals; later the long bones and finally all the bones of the skeleton. The diaphyses are primarily involved, but the epiphyses do not escape. The joints first show swelling and erosion of the cartilages and at times complete destruction of the cartilage, and ankylosis.

The author reports a case secondary to sarcoma and gives the autopsy findings.

F. B. SHELDON, M.D.

Secondary Hypertrophic Osteoarthropathy Following Metatastic Sarcoma of the Lung. Lloyd Bryan. Calif. and West. Med., April, 1925, p. 449.

Malignant renal tumors.—The authors say that the incidence of renal tumor is not great, occurring, in general, in about 0.06 to 0.1 per cent of the cases. There is a group of symptoms that are more or less constant and called the "Cardinal trio," namely, hematuria, pain and palpable mass. It is their experience that when the case presents these symptoms it is not an early one, and usually terminates fatally in spite of surgical aid, and yet over one-third of the cases operated on presented these symptoms.

The initial symptom may be any of these three. Hematuria is the most frequent in the adult and tumor in children, or it may be cachexia, vomiting, icterus, etc. That we have failed to make more than a slight impression on the progress is shown by the fact that the morbidity still remains at about 90 per cent. Such a figure shows that the diagnosis is too long delayed. This can be remedied only through early, thorough investigation. The urological investigation should be complete and include a differential examination of the urine, functional studies, and ureteropyelograms.

F. B. SHELDON, M.D.

Malignant Tumors of the Kidney, with Special Reference to Diagnosis. Frank Hinman and Adolph A. Kutzmann. Calif. and West. Med., April, 1925, p. 429.

Pulmonary malignancy.—The writer remarks that, while the possibility of making a correct diagnosis in pulmonary malignancy from the clinical symptoms is poor, fairly characteristic pictures can be obtained by radiography. He suggests the following classification, while admitting the impossibility of distinguishing between benign and malignant growths, or between carcinoma and sarcoma, from the X-ray plate. Primary sarcoma and non-malignant growths are, he adds, so rare in comparison with primary carcinoma that the matter is not of great importance. He describes six types of pulmonary neoplasms. The first type is the pneumonic form of bronchial carcinoma in which the affected lobe appears as a moderately dense shadow, which is invariably sharply limited by the interlobar fissure. The shadow is rarely dense enough to obscure that of the ribs, and lessens in intensity towards the apex and the lateral wall, thus distinguishing it from tuberculosis, which is, however, invariably present as a complication.

His second type is the hilum form of bronchial carcinoma. In this the hilum is very dense and five or six times its normal size. It appears as a semicircle from which fine grayish wavy striations pass into the lung, like a wooly infiltration.

His third type is the nodular form of bronchial carcinoma in which large, rather sharply outlined, nodules appear on one side of the thorax, communicating with the hilum by thin or thick dense shadows.

The fourth type is the cavernous, which, though exceedingly rare, should be suspected if one large solitary cavity in one lung is present. Fine striations may be seen running from it to the hilum.

The fifth type is the metastatic, in which the deposits may be isolated or disseminated.

Finally, in disseminated carcinomatosis of the lungs, the nodules, if of lymphogenous origin, appear a little larger than miliary tubercles, and are arranged in relation to a fine netlike structure over both lungs. In sarcomatosis the nodules are large and the netlike lymphatics do not appear.

Radiological Diagnosis of Pulmonary Malignancy. P. Kerley. Brit. Jour. Radiol., Sept., 1925, p. 333. (Reprinted by permission from Brit. Med. Jour., Oct. 24, 1925, p. 60 of Epitome of Current Medical Literature.)

Tonsils and adenoids.—The writer, who records ten illustrative cases in patients aged from 8 to 52, remarks that very many people object to surgery for the removal of tonsils, but readily consent to X-ray treatment, as it is painless and leaves the throat in a normal condition instead of inducing the state of chronic pharyngitis following an operation. Patients past middle life and those debilitated by some chronic intercurrent disorder such as valvular disease with loss of compensation, arteriosclerosis, diabetes, nephritis, goiter, and advanced forms of rheumatism, are unsuitable cases for operation and are successfully treated by X-rays.

The object of X-ray treatment of infective tonsils is the complete removal of all diseased tissue from the throat, leaving the parts in their normal condition and with permanent relief from the disease. During the last two years Wesley has treated a number of cases of infected tonsils by X-rays, with good results. Most of the recurrent cases have been in children, probably on account of the large amount of lymphoid tissue in the tonsils of younger subjects and the consequent poor contraction of the fibrous stroma. Eight applications were given, with the interval of a fortnight between them.

X-ray Treatment of Infected Tonsils and Adenoids. J. H. Wesley. Brit. Jour. Radiol., June, 1925, p. 221. (Reprinted by permission from Brit. Jour. Med., Oct. 24, 1925, p. 60 of Epitome of Current Medical Literature.)

Sex hormone.—Even with the present crude and not quantitative methods of concentration, these results show that: (1) the female sex hormone can be recovered from the circulating blood, and (2) the quantity in circulation is greater during estrus than during the interval.

W. W. WASSON, M.D.

Demonstration of the Female Sex Hormone in the Circulating Blood: Preliminary Report. Robert T. Frank, Marie-Louise Frank, R. G. Gustavson and Walter W. Weyerts. Jour. Am. Med. Assn., Aug. 15, 1925, p. 510.
